# AIR CONDITIONING HEATING AND VENTILATING

JANUARY, 1959—56th Year

500-Ton Absorption Type Water Chiller for Air Conditioning
See Page 75

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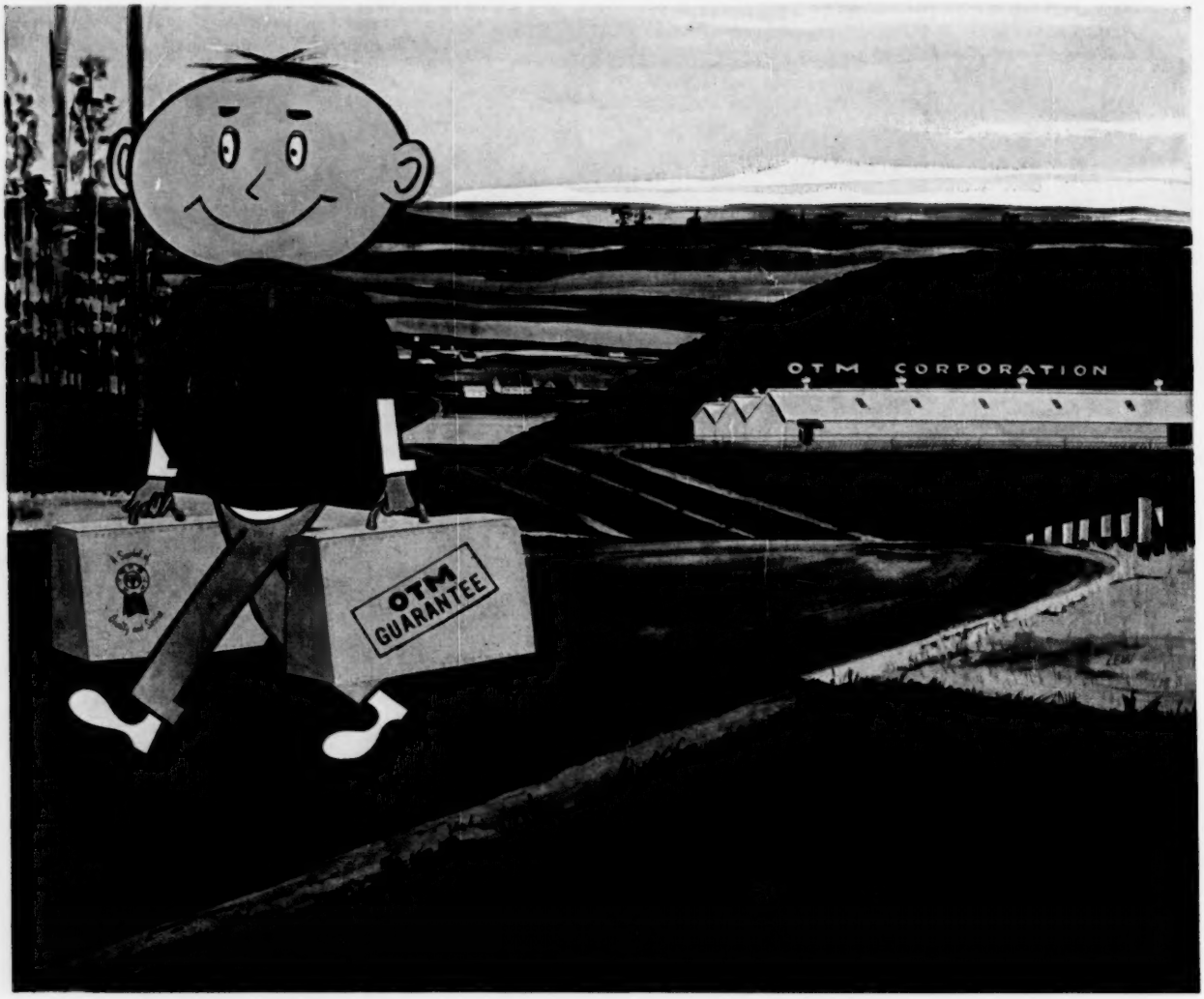


# PHIL FLANGE GOES TO WORK

. . . and he's carrying his OTM Blue Ribbon Guarantee. Every OTM Blue Ribbon Product (flange and fitting) is backed by the OTM Blue Ribbon Guarantee — the most comprehensive written guarantee in the industry. **Perfection Plus** is the pre-requisite in earning the Blue Ribbon Guarantee, and OTM insures perfection by use of Magnaflux*, Reflectoscope*, Brinell Meter and Profilometer inspections. **AND NOW!** OTM Blue Ribbon welding-neck and slip-on flanges are centerlined*.

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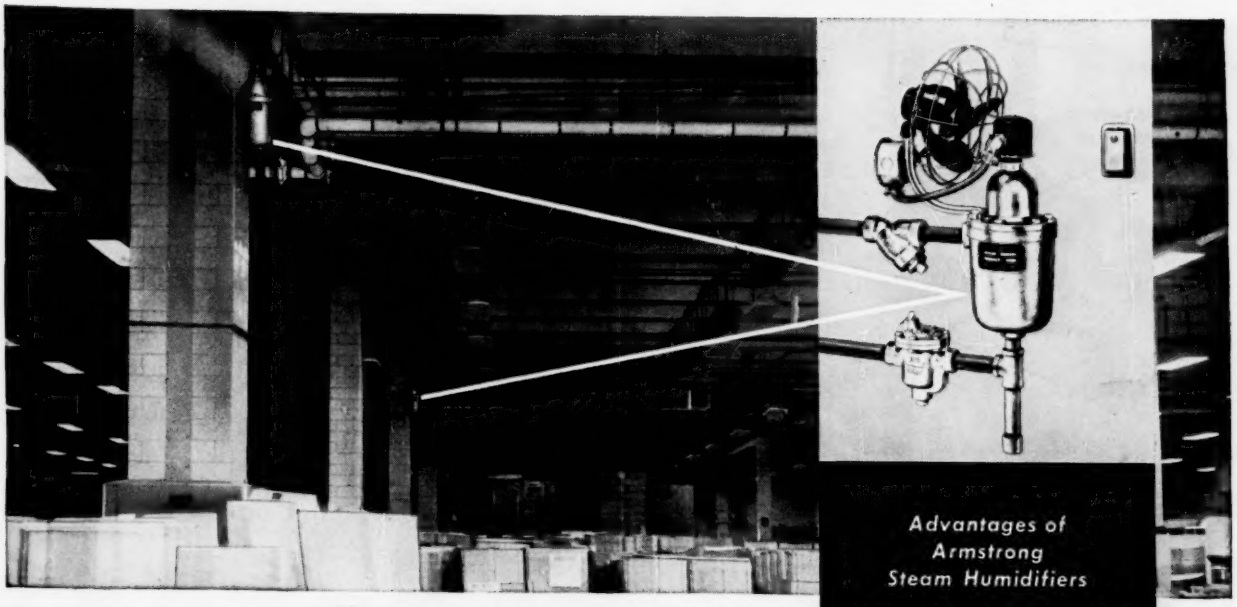
A-5-58

# These people have solved dry air problems with Armstrong Humidifiers . . . you can, too



*Here are two of the 29 Armstrong Humidifiers installed at Alford Cartons Division of Continental Paper Company, Ridgefield Park, N.J.*

**PAPER COMPANY**

"Armstrong Steam Humidifiers have reduced scrap losses and frequent machine adjustments caused by dry board. Maintenance of the units has been practically nil."

*—Alford Cartons Division, Continental Paper Company, Ridgefield Park, N. J.*

**FURNITURE MANUFACTURER**

"By eliminating cracking and checking of wood due to dryness, Armstrong humidifiers save $5000 to $6000 annually."

*—Vilas Furniture Co., Ltd., Cowansville, Quebec.*

**GENERAL OFFICE**

"Static caused operating difficulties in business machines. Two Armstrong humidifiers overcame the problem."

*—U. S. Rubber Co., Naugatuck, Conn.*

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"Armstrong humidifiers help keep leather soft, stop weight loss, help maintain quality."

*—A. F. Gallun and Sons, Milwaukee, Wis.*

**PRINTING PLANT**

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*—Nazarene Publishing Co., Kansas City, Mo.*

**ENGINEERING OFFICE**

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*—Burns & McDonald Engineering Co., Kansas City, Mo.*

**RUBBER COMPANY**

"Because of an explosion hazard, machinery is set to stop when humidity drops below 40%. It has never shut down since Armstrong humidifiers have been on the job."

*—U. S. Rubber Co., Indianapolis, Ind.*

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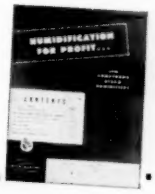
Bulletin No. 500 answers these questions: How can dry air affect profits? Why must relative humidity be accurately controlled? Why is steam better for humidification? What do users of Armstrong Steam Humidifiers report? How are the units installed? What are the initial and operating costs? What are the sizes and capacities? . . . and many other questions you may have.

*To get your copy, just send the coupon, or call your local Armstrong Representative today—there's no obligation.*

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**8464 Maple Street**
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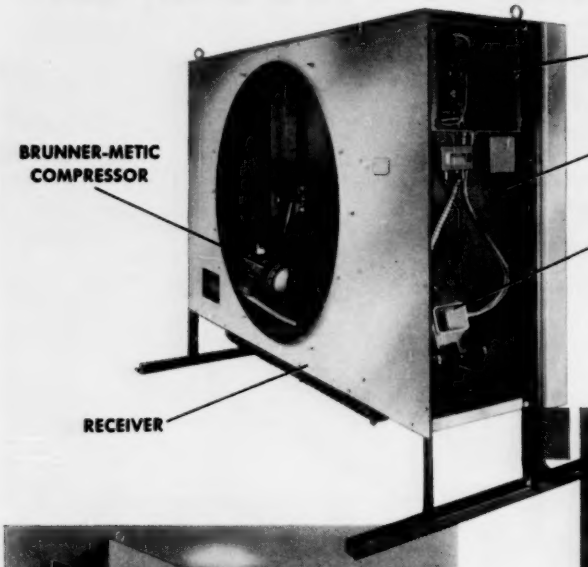
**Name**_____

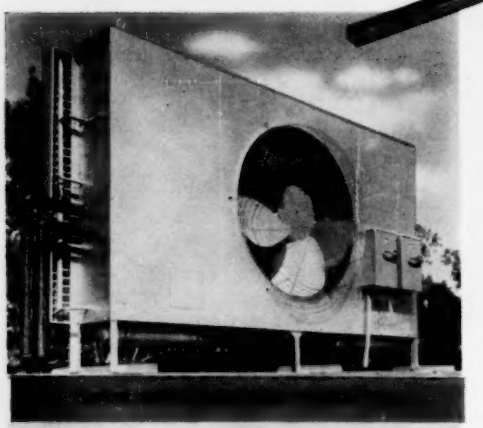
**(Clip to company letterhead and mail)**

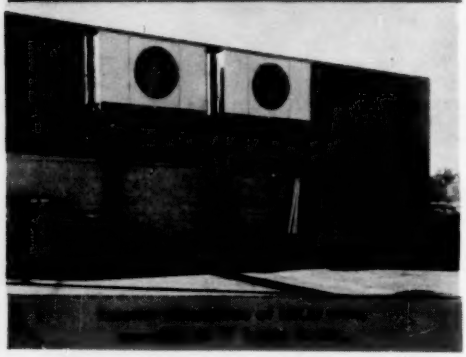
805-SH

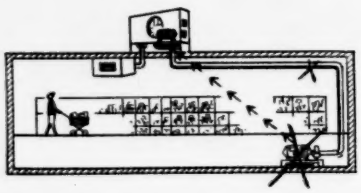
# NEW CONCEPT IN BUILT-UP AIR CONDITIONING SYSTEMS




## DUNHAM-BUSH 'LRCU' UNITS







By incorporating the compressor and receiver in the same casing as the remote air cooled condenser there are substantial savings in space and installation costs on built-up air conditioning systems.

Eliminate expensive installation costs . . . plumbing . . . wiring . . . with a Dunham-Bush 'LRCU' Large Remote Condensing Unit. Here's a complete package consisting of a remote air cooled condenser, semi-hermetic compressor, magnetic starter, receiver, controls and refrigeration accessories all piped and wired.

Install on the roof (or other convenient location) and run the necessary refrigerant lines to the lowside equipment. Make electrical connections and the system is ready for operation.

Available in 5 models from 10 to 30 tons. Two-step starting makes units readily adaptable for capacity control. Two compressors furnished on 20, 25, and 30 HP units.

***Write today for complete information.***

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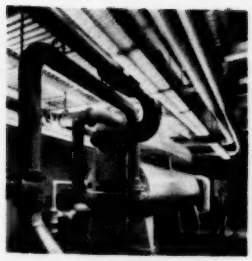
# AIR CONDITIONING HEATING AND VENTILATING

**Volume 56, Number 1** **January, 1959**

THE COVER



Steam operated 500-ton absorption unit supplies chilled water to air condition new Carrier Corporation administration and research center in Syracuse, N. Y.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[redacted]

♦ **Copper drainage tube sales jumped 155% in 1958,** and the jubilant Copper and Brass Research Association predicts a 140% increase this year. Introduced in mid-1956, DWV tube for drain, waste, and vent lines has met with success in both residential and non-residential buildings. Prior to its development, only copper water tube, designed to withstand service-line pressure, was available for sanitary drainage lines; DWV was developed as an economical pipe where pressures are minimal. To date, 165 cities, twelve counties, and seven states have given code approval. Among last year's approvals were Oregon and New York.

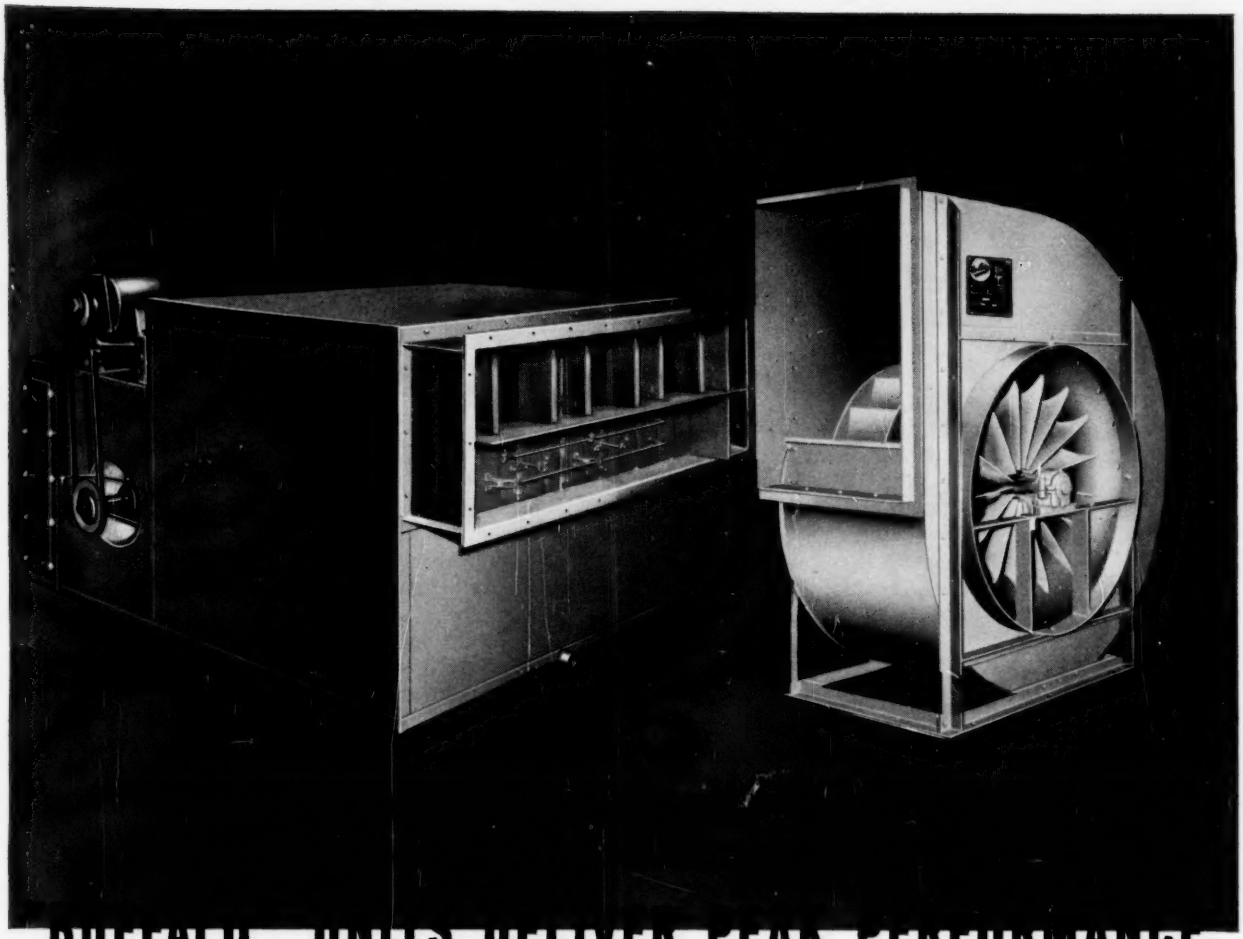
♦ **Housing for the elderly is receiving increased attention from governmental and private interests.** Apartments especially designed for older people constitute 10% of the Federally aided units in six northeastern states. According to Herman D. Hillman, New York regional director of the Public Housing Administration, five projects in New York City, Albany, Syracuse, Paterson, N. J., and Providence, R.I., will include 331 apartments for the aged.

**Scheduled for completion this spring, a cooperative apartment building** designed for exclusive use of the elderly is being erected in Irvington, N. J. The two-story structure will have moving stairs, inter-apartment buzzers for emergency assistance and considerable community avocational facilities.

**A privately owned apartment house in Queens, New York City, is in the process of conversion** from 118 four-and-one-half and three-room apartments into two groups of 59 units. One group will contain two-room suites for elderly couples. The Woodside colony was built twenty-three years ago.

♦ **All-plastic plumbing is one of the developments featured in the National Association of Home Builders' Research Institute House at Knoxville, Tenn.** The plumbing system utilizes a variety of types of plastic pipe and fittings manufactured by Carlon Products Corp., Aurora, Ohio. The hot water piping is fabricated from the company's polypropylene pipe, named Propylon. Experimental work shows that this pipe is entirely suitable for this application, but the company states that it is still evaluating other new materials that may prove even better. For this reason, plastic pipe for hot water installations is still considered to be in the development stage, although Propylon is available to qualified contractors upon application direct to the company. Instead of the usual single pressure-temperature relief valve, the NAHB house has two, one backstopping the other, each set at 175 deg F and vented to the outside. As a further precaution, a check valve is installed in the cold water feed line to the hot water heater so that hot water cannot back up from the heater into the cold water (plastic) piping.

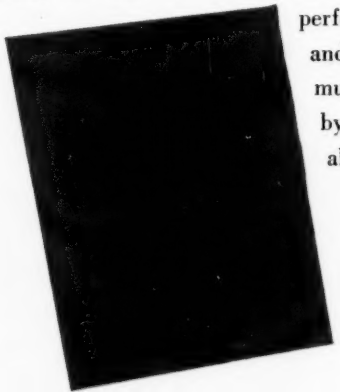
♦ **Damage to plants from smog is caused by an oxidizing agent,** according to Hugh T. Freebairn, a biologist at the University of California. This belief is based on the fact that injurious smog components can be removed from polluted air by using such metals as steel, magnesium, and zinc in filters. Also at California, reports Armour Research Foundation, scientists have discovered that complete combustion of incinerated refuse, as required in many California urban areas, produces a new, irritating air pollutant, formaldehyde. The solution, say the researchers, is to allow only enough air into incinerator for complete combustion.



# BUFFALO UNITS DELIVER PEAK PERFORMANCE

From Centrifugal Ventilating Fans to Exhausters — from Air Washers to Air Cleaning Equipment — "Buffalo" is famous for QUALITY. It is this reputation for quality — maintained and increased for more than 80 years — that assures you of finest performance, utmost dependability and long maintenance-free life. A "bonus factor" is that all "Buffalo" products are designed for easier, lower-cost installation.

High performance characteristics account for the popularity of "BL" Fans. The "BL" is designed for peak performance in Classes I and II service. The minimum maintenance enjoyed by users of these dependable "Buffalo" fans is directly due to unusually sturdy construction throughout — including housings, shafts, wheels, bearings. Installation is simplified by ample inlet collar for easy connection to ductwork. Capacities to 500,000 CFM. Write for Bulletin F-104.



"Buffalo" Zone Control Cabinets are quiet operating units which provide each of many zones with the accurately controlled temperature required. These units include heating and cooling coils, filter box, fan section, control dampers and motor base in a compact unit. Sectionalized design facilitates handling and installation. Externally located bearings simplify maintenance. Bulletin AC-220 gives complete details.

**BUFFALO FORGE COMPANY**
BUFFALO, NEW YORK
Buffalo Pumps Division • Buffalo, N. Y.
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"Buffalo"

# WASHINGTON OVERTONES

by LORING F. OVERMAN

● Washington's principal overtones at year-end concerned the favorable economic and business outlook for 1959.

Compared with a year ago, expansionist forces are overshadowing contractionist factors somewhat.

Over-all production, employment and incomes should rise about 5% over 1958. The advances will be spotty, however, with some weaknesses in the business picture.

● Newsmen attending the annual Business Outlook news conference of the United States Chamber of Commerce heard the situation summarized as follows by the organization's Emerson P. Schmidt, Director of Economic Research:

"It is difficult to forecast the future. All that is possible is to try to assess and weigh the contractionist and expansionist forces. However imperfect the art of forecasting may be, the business man, nevertheless, must make decisions based on his best judgment of events to come.

"At the close of 1958, the recovery which began last April continues. There are no obviously massive hurdles in the period ahead. It seems safe to assume that expansion will continue, but possibly at a reduced rate.

"Gross National Product should rise by $25-billion from the current level, reaching a new high of $470-billion to $480-billion next year; in 1960 we should, with ease, cross the $500-billion mark at today's prices.

"Substantial recovery to date has been without much benefit from capital goods revival or the automobile industry. Since the combined effect of these two large factors is likely to be on the plus side, this will give added strength to recovery forces.

"The construction industry is likely to contribute, but only moderately, to expansion above 1958 levels. The demand for loan funds (including heavy U.S. Treasury deficit financing), will tend to keep interest rates firm, or possibly rising a bit.

"The expanding factors have the edge, but not by an overwhelming margin. Prosperity has to be earned."

● Specifics in the construction field were outlined at the C of C news conference by William G. Dooly, Manager, Public Relations and Publications, Associated General Contractors of America. Those in air-conditioning, heating and ventilating fields will find encouragement in the following Dooly-notes:

"New construction for 1959 stands fair chance of reaching $52-billion.

"1959, up 6% over last year, largest jump in four years, should signal new era of construction growth.

"How much 1959 dollar volume will exceed or fall short of $52-billion will hinge on two volatile categories—residential and industrial construction. The first is influenced considerably by credit policies; the other is extremely sensitive to general economic conditions and to buying moods of the public.

"Major part of next year's advances should take place in public construction; up 16% to $17.4-billion, paced by highway construction.

"Residential construction; up 8% to $19-billion. Tightening credit and mortgage conditions latter part of 1959.

"Industrial construction; down another 10% to $2.2-billion; increased current planning could spark upturn late in 1959.

"Two other large business categories, commercial and public utilities, are seen steady at $3.6-billion and $5.5-billion respectively.

"Public education facilities, which rose only 2% in 1958, may increase 6% to $3-billion; possible 75,000 public classrooms to be provided in 1958-59 school year.

*(Continued on page 8)*

# NEW

as the 49th state

# HUSKY WELDING FITTINGS

Welded installations are generally conceded to be superior in all respects, but the high cost of available fittings has curtailed their use to any great extent in low-pressure systems. *Husky* fittings now supply the answer. They are made especially for 150 lb. welded systems . . . and are priced to make installed cost the same or less than that of threaded installations.

## FOR 150 lb. INSTALLATIONS *

Husky Straight Tees—No. 211
2" through 6"

Husky Reducing Tees—No. 211R
2" x 2" x 3/4" through 6" x 6" x 5"

Husky 90° Elbows—No. 207
2" through 6"

Husky Reducers—No. 201
2" x 1-1/4" through 6" x 5"

Husky 45° Elbows—No. 206
2" through 6"

* Fabricated from A106B seamless carbon steel tubing with minimum wall thickness of Schedule 40 tube in comparable sizes.

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**NIBCO INC.— Dept. JS-6301 Elkhart, Indiana**
Please send without charge your new Catalog H-1 that gives complete specifications and tells why *Husky* welding fittings are "7 Ways Better."

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## WASHINGTON OVERTONES *(Continued from page 6)*

"Conclusion: All qualified sources indicate construction headed for new record in 1959, dollarwise and in physical amount put in place."

● Not all in Washington hear the same pleasing overtones as those reported at the U.S. Chamber news conference. Representative Albert Rains (D-Ala.), Chairman of the Housing Subcommittee of the House Banking Committee, hears it this way:

"In my judgment, housing production will turn down considerably more than seasonably in January and February, and we may well face the danger of a serious slump in housing production next Spring."

Mr. Rains feels that current high rates of start are due to favorable mortgage conditions, held over from early 1958. Mr. Rains' plan for heading off a slump is to support legislation authorizing increased funds for the FNMA special assistance program to support mortgages. He will oppose the idea of higher interest rates on GI and FHA loans.

● Year-end summary by the Air-Conditioning and Refrigeration Institute winds up 1958 with a "better than '57" volume for most types of equipment, and with a most encouraging outlook for the industry in 1959 and the "sixties". Among the details:

—All indications point to an increase in sales of central residential air-conditioning as well as large commercial and industrial installation, and in number of product lines in the commercial refrigeration field.

—Small decline expected in sales of room air conditioners.

—Hotels and apartment houses loom as big new market. Management has found that non-air-conditioned space is increasingly difficult to rent; oldsters are being converted; virtually all new hotels, apartment buildings, motels and office buildings are including air conditioning in original plans.

—Index to the magnitude of the field is shown by the fact that installed value of systems (generally classified as having 25 tons or more of cooling capacity) amounted to $598,900,000 in 1957, a figure to which it grew from a 1950 installed value of $241,770,000.

—Dwarfing these figures is the potential, for surveys indicate that of all commercial and industrial establishments in the United States, only 22% were completely air-conditioned; 9% were partially air-conditioned; and 69% had no mechanical refrigeration of any kind.

"These are the figures on which the industry bases its optimism for 1959 and future years, as far as the commercial and industrial market for our product is concerned," said George S. Jones Jr., Managing Director of ARI.

● In the residential field, the way toward increased sales is indicated by a 1958 statement by the Federal Housing Administration. Said FHA: Inclusion of air-conditioning in FHA mortgages is urged on the ground that non-air-conditioned homes would be obsolete in many sections of the country in a decade.

● Air-conditioners continue to gain stature among Washington planners. Census Bureau is considering how to compile monthly statistics on retail inventories of air-conditioners, electric refrigerators, freezers, washing machines, dryers and cooking ranges.

Pre-test mailing of questionnaire to 2500 large concerns already reporting to Census Bureau will determine feasibility of the present plan.

● National Coal Association predicts an increase of 13.8% in soft coal production in 1959—up 55-million tons from this year's output of about 400-million tons.

Outlets: 163-million tons for electric utilities, up 7.1%; 105-million tons of coking coal for steel industry, up 36% from 1958; other industrial uses, up 1.4% to 106-million tons.

Retail market is expected to use 30-million tons, down 3.6% from 1958.

## *Figuring tubing materials on a cost per year basis?*

# NEW 4-D WROUGHT IRON costs less, lasts longer

The lower the cost per year, the more economical the investment. Especially so when the material lasts a long, long time. Take the cost comparisons below. Based on actual installations, users of wrought iron cold drawn tubing have been investing wisely for many years. Now, with new 4-D Wrought Iron available, your savings are even greater.

Note: New 4-D Wrought Iron was achieved by substantially increasing the deoxidation of the base metal, slightly increasing the phosphorous content and using a more siliceous iron silicate.

Result is *increased* corrosion-resistance, *improved* mechanical and physical properties.

| INSTALLATION | COST PER FOOT PER YEAR | |
|---|---|---|
| | WROUGHT IRON | STEEL |
| Hotel, Brooklyn, New York<br>Hot ammonia gas passing through interior of tubes, cooled by salt water circulating along outside of tubes. | $ .03<br>(19 years) | $ .24<br>(2 years) |
| Ice Company, Chicago, Illinois<br>Carbon dioxide condenser service. | .03<br>(18 years) | .05<br>(10 years) |
| Film Corporation, Binghamton, New York<br>Tubes used in cooling service. | .04<br>(15 years) | .06<br>(8 years) |
| Industrial Plant, New Bedford, Massachusetts<br>Ammonia condenser with salt water in coolant. | .04<br>(12-14 years) | .48<br>(1 year) |
| Industrial Plant, Toronto, Canada<br>Tube and shell type condenser used for cooling brine with ammonia. | .01<br>(50 years) | .07<br>(7 years) |
| Ice Company, Aiken, South Carolina<br>Ammonia condensers with mild brine solution containing 76 ppm sodium chloride for cooling. | .03<br>(18 years) | .29<br>(2 years) |
| Ice Company, Rocky Mount, North Carolina<br>Condensers with mild brine solution containing 75 ppm sodium chloride for cooling. | .07<br>(8 years) | .16<br>(3 years) |
| Industrial Plant, Wisconsin<br>Vaporizers for production of butane and propane gas. Severe stresses created by wide temperature variances. | .28<br>(2 years) | .96<br>(6 months) |
| Oil Company, Long Island City, New York<br>Cool, weak ammonia liquor cools hot, concentrated ammonia liquor coming from generator on the way to absorber. | .03<br>(20 years) | .07<br>(6-8 years) |
| Process Company, Detroit, Michigan<br>Heat exchangers with ammoniated brine concentration of about 10% ammonia and salt almost to saturation point. | .08<br>(8 years) | .16<br>(3 years) |
| Gas Company, Brooklyn, New York<br>Ammonia condenser with cooling medium of creek water contaminated by the refuse from several nearby industrial plants. | .05<br>(16 years) | .22<br>(3-5 years) |
| Alkali Company, Saltville, Virginia<br>Heat exchanger carrying ammonia liquor that is subsequently cooled by surrounding water. | .05<br>(16 years) | .30<br>(6 mos.-3 years |
| Industrial Plant, Chicago, Illinois<br>Condenser tubes in absorption system. Ammonia inside the tubing is about 200°F. and water outside the tubes is about 40°F. | .09<br>(9-11 years) | .28<br>(3 years) |
| Electric Utility Company, Hunts Point, New York<br>Gas cooler drawing water from East River in New York City. | .15<br>(8-9 years) | .45<br>(2-3 years) |
| Warehouse & Cold Storage Corp., Springfield, Massachusetts<br>Ammonia condensers and direct expansion cooling coil. | .02<br>(30 years) | .04<br>(12 years) |

"Cost per foot per year" figures are calculated from current prices of cold drawn seamless steel tubing (ASTM A-179) and cold drawn wrought iron tubing (ASTM A-382). Because of the many variables involved, costs for installation labor, maintenance and replacement are not included. If they were, wrought iron's low cost story would, of course, be even more impressive.

Details on any of the above installations furnished on request. Write for Wrought Iron Heat Exchanger and Condenser Tubing bulletin.

**BYERS 4-D WROUGHT IRON**

TUBULAR AND FLAT ROLLED PRODUCTS

A. M. BYERS CO., CLARK BLDG., PITTSBURGH 22, PA.

**Corrosion costs you more than Wrought Iron**

# BRIEFLY STATED

## ENGINEERING SOCIETIES

Members of the two societies have voted for the merger of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS and the AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. This was announced by ASHAE president, E. R. Queer and ASRE president, Cecil Boling in a joint statement following completion of balloting December 1 at a special meeting of ASHAE in Chicago, Ill. and at the ASRE Semi-Annual Meeting in New Orleans, La. *The consolidated society will be named the* AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE). Each society recorded a high total number of ballots with 93% of ASHAE and 73% of ASRE voting for the merger. ASHAE ballots totaled 5712 with 5307 favoring and 405 opposing the merger. ASRE members voted 3516 for and 1293 against the merger with a total of 4809 ballots. A two-third majority of the total vote was required to approve the merger . . .

*Constantin P. Yaglou,* professor of industrial hygiene, Harvard University School of Public Health, will be the 17th recipient of the F. Paul Anderson Medal, highest award of ASHAE. Presentation will be made at the Society's 65th Annual Meeting at the time of the annual banquet on Wednesday, January 28, 1959. The medal is given in recognition of outstanding work in the field of heating, ventilating and air conditioning. Prof. Yaglou has been engaged in teaching and research at the Harvard School of Public Health for more than 30 years, gaining a reputation for his studies in the hygienic aspects in air conditioning. He was born in Constantinople, Turkey, is a graduate of the Engineering School of Robert College, Turkey, and completed his formal educational work at Cornell University. From 1921-25 he served on the staff of the ASHAE Research Laboratory, and was closely associated with most of the pioneering studies in the development of the original Effective Temperature scales, determining the original comfort zone, and studies of the physiological effect of heat or cold and in studies of metabolism and its effect on ventilation problems . . .

The grade of Fellow has been conferred on four members of the Council of ASHAE. These members will be honored with the conferring of the Fellow grade at the 65th Annual Meeting of the Society at the time of the Welcome Luncheon, Monday, January 26. The recipients are:

*Past President Merrill F. Blankin,* president, Blankin Equipment Corp., Philadelphia, attended Drexel Institute of Technology;

*ASHAE Director of Research Burgess H. Jennings,* who is in charge of Society research activities both at the ASHAE Research Laboratory and at cooperating institutions since 1957. Born in Baltimore, Md. where he attended Johns Hopkins University, Mr. Burgess in 1940 was appointed professor of mechanical engineering at Northwestern University, Evanston, Ill. and served as chairman of that department from 1942 to 1957. He is a past president and fellow of ASRE.

*Professor Richard C. Jordan* the third recipient, is head of the department of mechanical engineering at the University of Minnesota and a nominee for a second term on the ASHAE Committee on Research. He is a past president and vice president of the ASHAE Minnesota Chapter. A member of many Society Technical Advisory Committees, Prof. Jordan is a past president and fellow of ASRE and recipient of that Society's Outstanding Publications Award in 1953. The fourth recipient is *Benjamin H. Spurlock, Jr.,* professor of mechanical engineering at the University of Colorado and director of the University graduate studies, department of mechanical engineering since 1946. Born in Lithonia, Ga., he was graduated from Georgia Institute of Technology in 1938 with a B. S. in engineering and in 1939 he received his M. S. from Massachusetts Institute of Technology. He was made an associate professor at the University of Colorado in 1947. Besides his duties at the University, Prof. Spurlock has served as a consultant to the city of Denver and has been chairman of the steam heating division of the Denver Board of Examiners, since its beginning in 1952.

*James M. McGrath is appointed head of the Air Conditioning and Refrigeration Engineering Department, California State Polytechnic College, San Luis Obispo, Calif. He succeeds Norman Sharpe who asked to be relieved of his administrative duties and to return to full-time teaching after 21 years as department head. The college announced establishment by the Hugh H. Logan Foundation of a $500 scholarship to be awarded each spring to a student at the college planning to enter the field of air conditioning, heating, or plumbing.*

## AMONG THE ASSOCIATES AND INSTITUTES

The Board of Trustees of the INDUSTRIAL HYGIENE FOUNDATION announced the election of Dr. William P. Yant, director of research and development, Mine Safety Appliances Company, as chairman, Board of Trustees; and the appointment of Dr. H. H. Schrenk, research director of the Foundation since 1949, as managing director to succeed Dr. C. Richard Walmer, who is returning to private medical practice. Both Dr. Yant and Dr. Schrenk are widely experienced in the fields of industrial and public health. Dr. Schrenk directed the Donora smog investigation for the U. S. Public Health Service, and is a recipient of the Donald E. Cummings Memorial Award from the American Industrial Hygiene Association for outstanding contributions to his profession. Dr. Yant recently received the Arthur Williams Medal of the American Museum of Safety for "outstanding contribution to the conservation of human life." He participated in the formation of Industrial Hygiene Foundation and has served as a trustee since its inception. The Foundation is a nonprofit research organization of about 400 companies and industrial associations whose purpose is to improve health conditions in industry, a program

*(Concluded on page 12)*

# *And for* UNION CARBIDE — A FUTURE OF FAULTLESS SERVICE

Soaring from the tracks of the New York Central at the focal point of Manhattan's office building boom is the gleaming black stainless steel and glass shaft of the 52 story Union Carbide Building . . . to be completed in 1960 as the tallest on Park Avenue and to be serviced by over 800 DELANY flush valves. This sleek tower will contain no basement, will have an attractive esplanade on the ground floor, and will utilize escalators for access to a unique second floor lobby. A 12 story section to the rear will fill out the site, a square block in all. The Union Carbide Building is a quality structure in every respect. COYNE & DELANY CO. is proud that DELANY diaphragm type flush valves were selected for specification in keeping with such carefully formulated standards.

Here, DELANY flush valves will be brush chromed and fitted with increasingly popular 3" discs. Why don't you check into DELANY—"the fastest growing name in flush valves!"

UNION CARBIDE CORP. HOME OFFICE
*New York, N. Y.*
SKIDMORE, OWINGS & MERRILL
*architects*
SYSKA & HENNESSY
*mechanical engineers*
GEORGE A. FULLER CO.
*general contractor*
JARCHO BROTHERS, INC.
*plumbing contractor*
SMOLKA CO., INC.
*wholesale distributor*
RICHMOND PLUMBING FIXTURES DIVISION
*of* RHEEM MANUFACTURING CO.
*plumbing fixtures manufacturer*

**CHROME "MUSHROOM" DISC MINIMIZES ROUGHEST TREATMENT**

*Kicking of flush valve handles and similar rough usage is virtually eliminated when the Delany 3" mushroom disc is used. Presenting a neat architectural appearance due to its compact silhouette, the 3" disc can be actuated by the back of the user Located over the centerline of the fixture, the 3" disc is difficult to reach with the foot. Results: Chrome stays bright and strain on valve is reduced.*

**COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK**
IN CANADA: THE JAMES ROBERTSON CO. LTD.

DELANY *Flush* VALVES
Since 1879

## BRIEFLY STATED

*(Concluded from page 10)*

involving a staff of physicians, chemists, engineers, biochemists, and medical technicians, all specialists in industrial health problems . . .

The Fall Meeting of the FLUID CONTROLS INSTITUTE, INC., (formerly National Steam Specialty Club) in Chicago was opened by its president, Dean E. Madden, A. W. Cash Valve Mfg. Corporation. Chairman of the meeting was J. R. Lawler, Lawler Automatic Controls, Inc. A panel discussion on the subject of research and development was followed by a luncheon at which guest speaker Ervin J. Osterhus, vice-president of Fluid & Mechanical Engineering, Designers for Industry, Cleveland, Ohio spoke.

### BRANCHING OUT

MCMURRY & COMPANY of Miami, and H. L. MCMURRY & COMPANY of Jacksonville, Fla., are new sales representatives for The Air-Maze Corporation, Cleveland, Ohio. They will handle the application and sale of air and liquid filters for use in air-conditioning and ventilating systems, as well as for industrial products such as engines and compressors. . .

MODINE MANUFACTURING CO., Racine, Wis., has named J. F. SCOULER COMPANY sales representatives for the Harrisburg, Pa. territory. The firm, located at 2120 Market Street, Camp Hill, Pa., will handle the company's complete line of heating and air conditioning equipment. CHAS. A. GREGORY AND ASSOCIATES, Richmond, Va., are appointed sales representatives for the Richmond territory; BETTER AIR PRODUCTS CO., Baltimore, Md., representatives for the Baltimore territory; and HEET-FLO COMPANY is named sales representatives in the Los Angeles territory. Heet-Flo is comprised of H. M. Rubenstein and Arthur Tveten, both men having been salesmen for the firm which previously represented Modine in this area. . .

ELDON C. THOMAS CO., 627 W. 2nd Street, Oklahoma City, will handle the complete line of commercial and industrial air filtration equipment for FARR COMPANY, Los Angeles, Calif. . .

New distributor of packaged air conditioning equipment for THE TRANE CO., La Crosse, Wis., is CONDITIONED AIR, INC., 1501 Clay Street, Houston, Tex. This line includes equipment for year-round air conditioning and heating in homes, and self-contained air conditioning units for commercial and institutional applications.

### BURGEONING BUSINESS

Establishment of INFRA RED DIVISION by VAN DORN IRON WORKS CO., Cleveland, Ohio, follows development of a gas-fired infra-red heater of American design and said to be more efficient than any yet on the market. Burner-generator has no ceramic parts, but utilizes metallic stretcher screens expanding with the cast frame. Applications envisaged include space heating, coin-operated barbecues in public parks, freeing of frozen bulk commodities from railroad cars, drying operations, etc. Van Dorn, well known as a manufacturer of jail equipment, is broadening its product line.

CONSOLIDATED DIESEL ELECTRIC CORP., Stamford, Conn., announces that its newly-organized subsidiary, HAMMOND VALVE CORPORATION, has acquired the business and assets of HAMMOND BRASS WORKS, INC., Hammond, Indiana. Hammond Brass was established in 1911, and produces bronze valves for plumbing, heating, and industrial applications. Samuel Greenwald, president and chief executive officer of the predecessor company, will serve in the same capacity with Hammond Valve. . .

REVCOR, INC., Carpentersville, Ill., manufacturers of blower wheels and housings, has purchased the Bronson fan line from BRONSON FAN MANUFACTURING CORP., Los Angeles, Calif. All manufacturing operations on the fan line will be moved to Carpentersville. Addition of this line to its present blower wheel line is said to enable the company to offer complete air impeller service to the air conditioning, heating, and ventilating field. . .

CLEAVER BROOKS CO., Milwaukee, Wis., has acquired the 68-year-old SPRINGFIELD BOILER CO., Springfield, Ill. In the past, Cleaver-Brooks has concentrated on the production of packaged fire tube boilers for process and comfort applications in a range up to 20,000 lb steam per hr. Now it moves into the water tube boiler field and will be able to service all major boiler markets, the company states. It will deliver water tube boilers up to 50,000 lb steam per hr in the packaged units, and 300,000 lb steam per hr for field-erected units. Springfield Boiler was founded in 1890 and remained in the founder's hands until 1946, when it was sold to Paul H. Davis Co., Chicago, Ill. In 1953 it was sold to John W. Hobbs Corporation. Hobbs merged with Stewart Warner in 1955, at which time Springfield Boiler emerged again as a separate corporation with stock ownership transferred to several former stockholders of Hobbs. There it remained until its purchase by Cleaver-Brooks. . .

A new plant of UNITED STATES GAUGE DIV., AMERICAN MACHINE AND METALS, INC., Sellersville, Pa., has doubled the floor space available for gage and instrument production. The four acres under roof is air-conditioned throughout. Specially designed automatic conveyors and other equipment are installed for painting, plating, and drying, and latest designs in high-speed screw machines, gear cutters, and lathes produce millions of precision parts, the company states. . .

An Open House for architects, engineers, contractors, owners, builders, and managers of real estate at the new enlarged offices and labs of WATER SERVICE LABORATORIES, INC., New York, N. Y., featured the company's Corrosion Research Exhibit, which has received national attention. There is a growing recognition of the importance of water treatment in the protection of air conditioning equipment, the company states.

*The Third General Assembly of the Center for Experimental Refrigeration, Madrid, Spain, will be held during the week of February 23-28, of this year. Further information may be had from the Director, Manuel Estada Girauta, Centro Experimental del Frio, Serrano 150, Madrid, Spain.*

...economical G. I. type

# PACKAGED INDUSTRIAL FANS

...featuring flat radial blade wheels

A packaged industrial fan is now offered to cope with virtually any industrial air or material handling problem. Weather cover is removable, and motors and drives may be installed, removed, serviced or adjusted on the job by one man. All units are rotatable and reversible in the field. Available in wheel sizes from 14 inch thru 36 inch. Send for Bulletins 585 and 586.

LS TYPE

LM TYPE

For BIG performance

nyb

Packaged industrial fans provide LS TYPE wheels as standard, but may be furnished with LM TYPE at slight additional cost. A completely redesigned line of industrial fans is also offered, with wheel sizes from 10 inch thru 78 inch.

**THE NEW YORK BLOWER COMPANY**

Sales Offices: 3147 South Shields Avenue • Chicago 16

One 25-ton water chiller cools chapel at Keenan & Stanford Halls

I. A. O'Shaughnessy Hall

## University of Notre Dame

Gets Economical Air Conditioning with **Arkla-Servel** Water Chillers

Morris Inn cooled by three 25-ton units

# Now we're cooling with **GAS**!

The famed home of the "Fighting Irish", University of Notre Dame recently embarked on a long-term modernization and expansion program. Up-to-date, economical air conditioning is provided by Arkla-Servel GAS-operated units.

The Arkla-Servel absorption-type water chiller guarantees long service-free life because it has no moving parts. Water is the refrigerant, and the energy source is low-pressure steam obtained from a direct-connected gas boiler which is also used for heating. During hot weather, low pressure steam applied to the chiller produces all the comfort cooling needed. Seasonally idle or excess boiler capacity is thus put to use on a year 'round basis, cutting operating costs to a minimum.

Because of its light floor loading and freedom from vibration, single or multiple Arkla-Servel units can be installed on any floor from basement to roof. Find out how you too can put your present heating system on a year 'round paying basis. Just call your local gas company for details, or write to the Arkla Air Conditioning Corporation, General Sales Offices, 812 Main Street, Little Rock, Ark. *American Gas Association.*

New Moreau Seminary

**GAS OPERATED ARKLA-SERVEL ABSORPTION-TYPE WATER CHILLER**

- lowest operating costs
- fully automatic operation
- long dependable service
- packaged construction
- compact size; easy installation

# Scientific Frontiers

• A unique "water tunnel", which permits three-dimensional studies of fluid motion around complex structures, is helping Westinghouse Electric Corporation perfect designs for steam turbines, large ventilating fans, and other rotating equipment. Essentially, the water tunnel serves the same purpose as a wind tunnel, although it is smaller and uses a liquid medium rather than air. It allows engineers to study and photograph fluid flow around a structural model or machine component. For research purposes, a water tunnel offers several advantages over a wind tunnel. Because water is more dense than air, it will produce the same flow patterns when moving only about one-thirtieth as fast as air; also, there is no satisfactory way to see highly turbulent flow around closely spaced objects in a wind tunnel. The water tunnel, actually a vertical pipe about 2 ft in diameter and 20 ft high, has one section made of clear plastic, inside which the mounted model being studied is visible. Temperature of the 13 tons of water in the tunnel is adjustable from room temperature to 150 deg F.

• A new method of observing water level in boiler drums is reported in the February, 1958, issue of the Russian *Elekt, Stantsii* by Dementyev, Ioffe, and Krol. As translated in Combustion Engineering's *C.E.G.B. Digest,* the story is this: The radioactive level gage, devised by the Engineering Institute of Thermal Engineering, permits convenient and reliable contactless remote control of water level in boiler drums. Operation is based on the difference in penetrability of water and steam by gamma rays emitted by radioactive isotopes. It is particularly useful in boilers of over 100 atmospheres absolute pressure, where it is expected to replace the conventional water level gage which, according to the report, is unreliable at extra high pressures.

• Noise research is paying off in at least two areas, according to scientists at Radio Corporation of America. A new electronic "earmuff", actually an earphone, broadcasts counter-irritant noise into ear of combat soldiers to make sure they hear vital communications over violent battle racket. Phone noise is just as loud as battle noise but in opposite phases; two sounds largely cancel each other, and exterior noises are reduced to a whisper. Also at RCA, engineers have developed a device, called a compressed air loudspeaker, to make what they call the world's loudest noise. Unit will be used in testing vibration- and sound-sensitive electronic parts for jets, missiles, and rockets. Unit generates noise at 160 decibels, and may be able to throw human voice ten miles or more.

• The Atomic Energy Commission has given notice that it proposes to issue a license to Industrial Waste Disposal Corp., Houston, Tex., authorizing disposal of radioactive waste material in the Gulf of Mexico beyond the continental shelf. Under the proposed license, the company would collect pre-packaged and labeled low-level waste material, in containers meeting Interstate Commerce Commission specifications, from other AEC licensees at a definite collection and storage point. Packages received would not be opened, but would be further packaged for sea disposal by being encased in reinforced concrete of sufficient density to insure sinking to a minimum depth of 1000 fathoms (6000 ft). Low-level wastes of the sort covered by the proposed license are generated from medical, industrial, and research programs involving use of nuclear materials. They usually consist of residual solutions from experiments, contaminated blotting paper, cleaning rags, broken test tubes and other glassware, carcasses of animals that were used in tracer or other biological experiments, and sealed radioactive sources which have decayed to unusable levels. The AEC does not authorize sea disposal of high-level radioactive wastes. These are stored in underground tanks at various AEC sites.

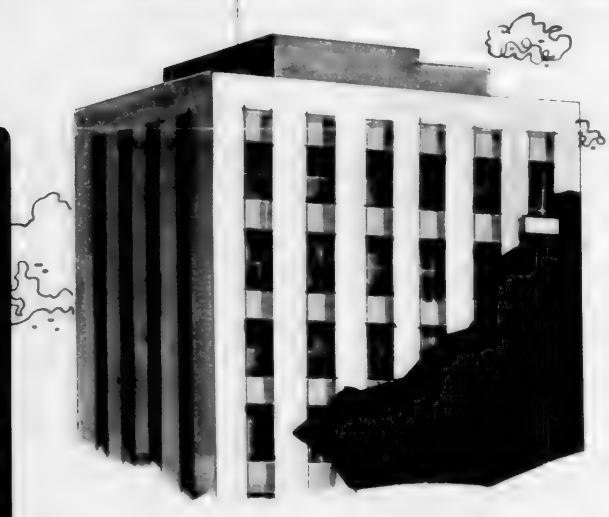
# LOOK INSIDE....

SEE HOW YORK BORG-WARNER

NOW BRINGS YOU THE FOUR
BIG FORWARD STEPS IN
AIR CONDITIONING AND HEATING

# LOOK

**Revolutionary 3 ... ith Instant**
**Response That Elimin... r and Water**



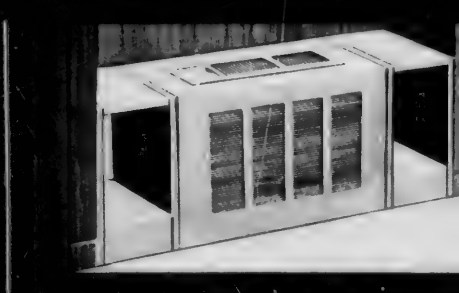
Here is an induction air conditioning system that is unusually simple to lay out, and yet possesses flexibility never before attained in systems of this kind.

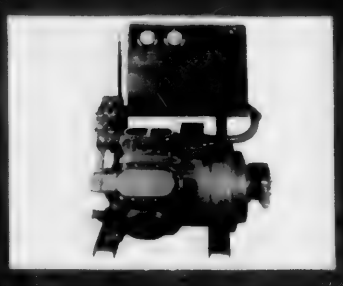
Designed around YORK's new Hi-I induction unit, the 3-pipe system eliminates summer-winter changeover and nighttime shutdown, and offers dramatic savings in power and steam costs.

No zoning of ventilating air or supply water is required. Constant quantities are delivered uninterruptedly to all points. Room temperatures are completely and automatically controlled at individual room units.

Automatic unit control valve provides room occupants with 50% greater personal comfort control the year 'round.

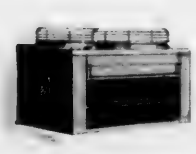
*Plus!*



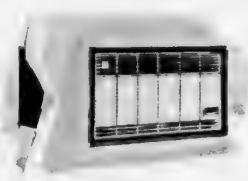


## LOOK INSIDE York Packaged Product

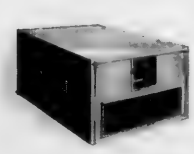
## For Answers to Your Special Problems:



**York Champion Air Conditioners** for commercial use are air cooled...use *no water*...deliver 10 to 15 tons of natural cooling. Have step-start, step-capacity control.

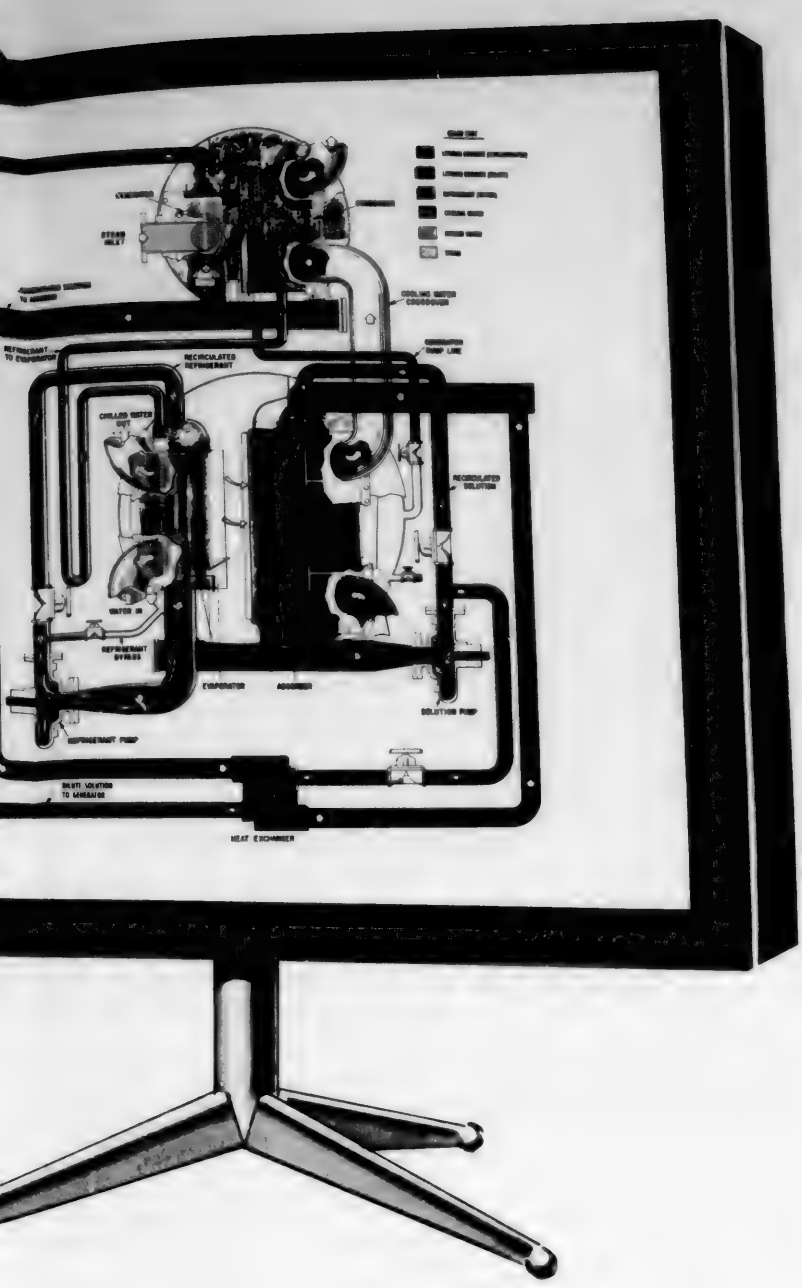


**York Room Air Heat Pum** cool in summer, heat in wint Three compact, stylish windo units: (1) Citation, 230 V. Medalist, 115 V, 7½ Amp., Metropolitan, 230 V.



**York Residential Heat Pumps** cool in the summer, heat in the winter—using only outside air and electricity. Have twin cooling systems, twin auxiliary heaters.

**York Furnaces** have exclusive Silv "V" Burners that provide more he more economically. Fully A.G.A. a proved for use with natural mixe propane or manufactured gas.



You are looking at the latest development in automatic, heat-operated water cooling systems.

Low-pressure steam or high-temperature water is the activating medium. No motor drive, no expensive starters or heavy electrical conduit needed.

Tap water is the refrigerant, lithium bromide the absorbent. Once the system is charged they need never be replaced.

Savings in operation, installation and maintenance are the most important advantages here over motor-driven refrigeration systems.

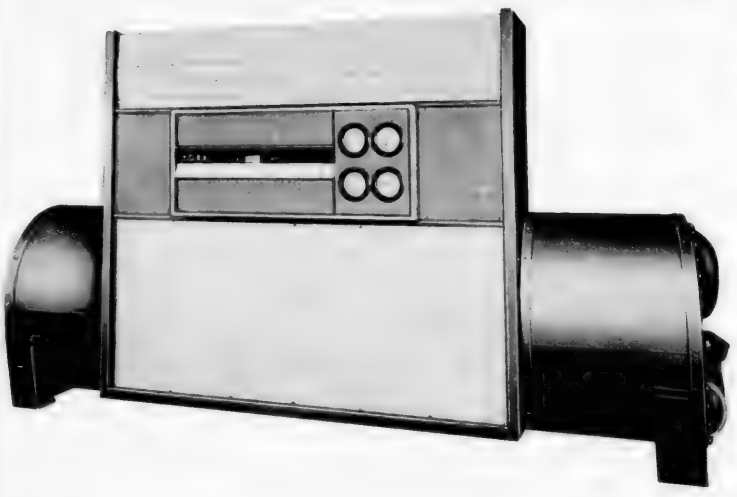
In addition, YORK's perfected method of fluid distribution throughout the system requires less pump horsepower per ton of cooling.

Notice how the lithium bromide solution trickles over the outside surface of the steam-filled generator tube bundle. System responds faster at start-up and can be more closely controlled to meet sudden load changes. There's less noise, too.

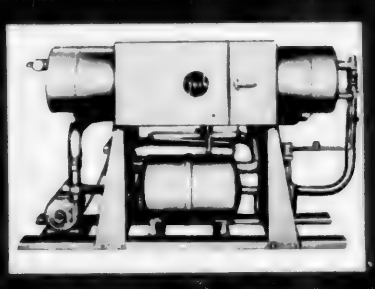
Wherever low-pressure steam or high-temperature water is available — in office buildings, hotels, hospitals and industrial plants — there's a place for a YORK Lithium-Bromide Absorption System. Available in capacities ranging from 100 to 740 tons.

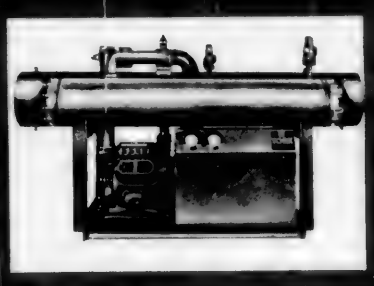
# LOOK INSIDE

## The First Completely Packaged Hermetic Centrifugal Water Chilling System



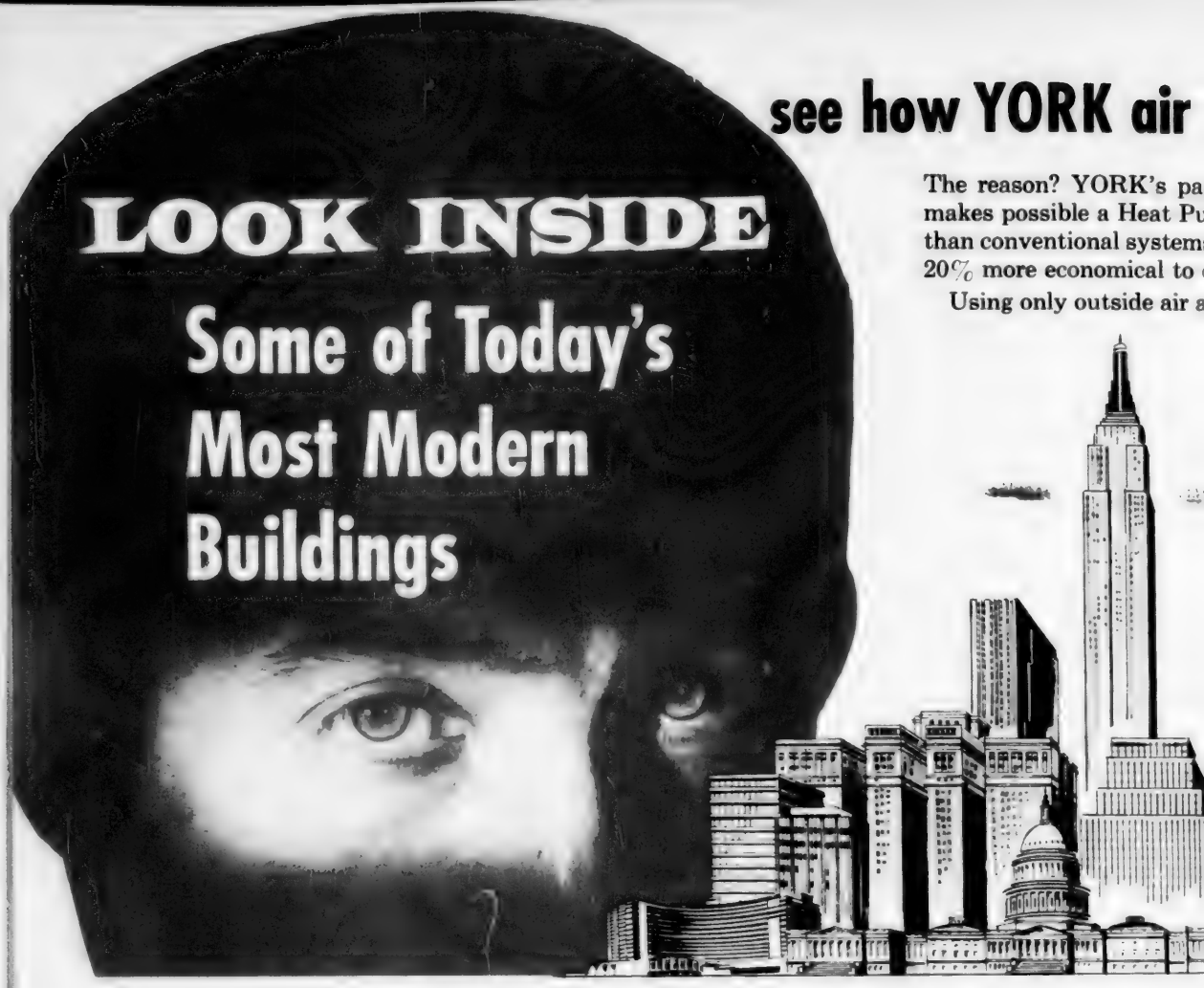
You'll see a factory engineered-and-packaged centrifugal water chilling system, complete in every sense of the word. It's the YORK single-stage TURBOPAK, and it's hermetic. Lighter and 50% smaller than any other comparable system, too. The secret lies in the built-in world-famous Borg-Warner transmission gear. There's a fully wired, electronic control center for precise, automatic capacity control. One piece, rigid base construction simplifies layout, eliminates field assembly.





## Certified Maintenance

For system performance without maintenance worries, a YORK Certified Maintenance Contract is what you're looking for. Gives you complete maintenance, regular inspections, emergency service when required, all parts and repairs, spring and fall changeover, and start-up and shut-down. All for a nominal, agreed-on-in-advance fee.




## see how YORK air

The reason? YORK's pa
makes possible a Heat Pu
than conventional system
20% more economical to
Using only outside air a

# LOOK INSIDE

## YORK's exclusive compound-compression d
## makes Heat Pumps practical even in northe

- **OPERATES EFFECTIVELY AT SUB-FREEZING TEMPERATURES**
- **FROM 42% TO 67% MORE HEAT FOR THE SAME POWER**
- **ELIMINATES COSTLY, SUPPLEMENTARY STRIP HEATING**

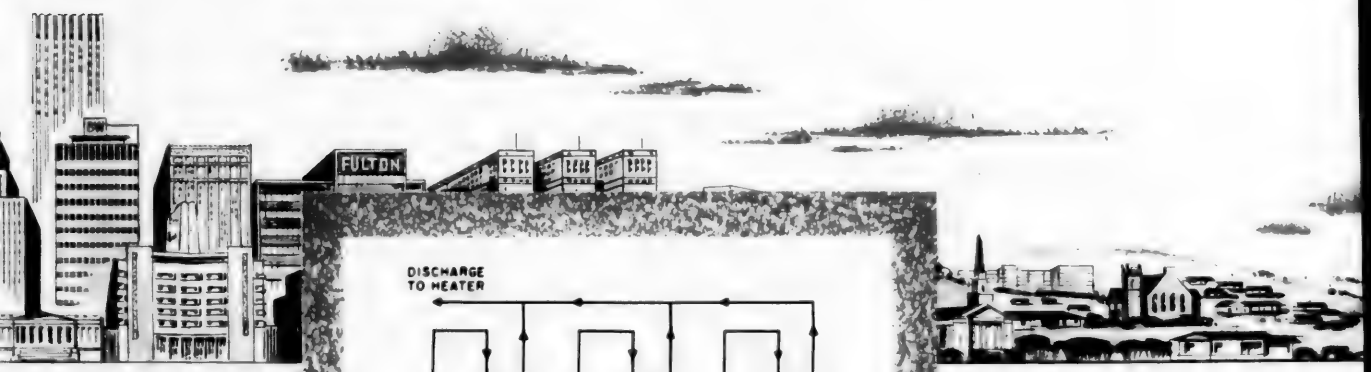
# source Heat Pumps out-perform conventional systems!

atented compound-compression design
Pump that delivers more Btu's per watt
ns. In actual installations, it has proved
operate.
and incoming power lines (no coal, gas,

oil or supplementary electric heaters are needed) a YORK Heat Pump maintains year-round comfort conditions in commercial and industrial buildings of all types and sizes—even in areas having winter design temperatures below freezing.

It has all the advantages of separate heating and cooling systems without the disadvantage of costly seasonal shutdowns and start-ups. Space normally provided for boiler rooms, fuel storage facilities and chimneys can be utilized for business profit production.

Rapid acceptance of this revolutionary new system is shown by the fact that more YORK Central Station Heat Pumps have been specified than those of all other manufacturers.

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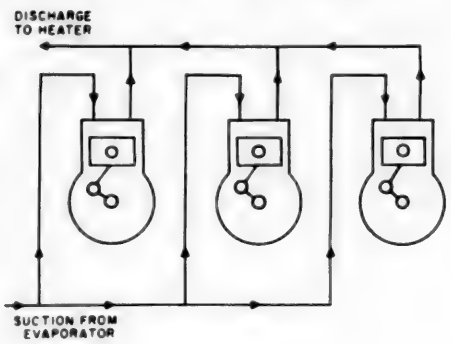
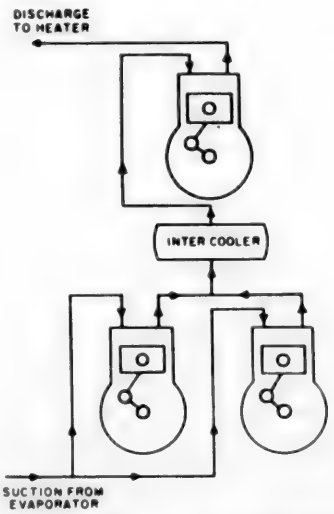



**In single-stage compression,** equal amounts of refrigerant are compressed in each cylinder. This method does not provide sufficient heat when outside air temperatures are below 25 or 35 F. Electric heaters must then be used.




**In compound compression,** equal amounts of refrigerant are first compressed in two cylinders. Some heat of compression is withdrawn in an intercooler. All the refrigerant is then compressed in the third cylinder to a higher temperature and pressure. This method provides sufficient heat even during subfreezing weather.

# LOOK INSIDE

[illegible] 150-250-350-450 at the International
[illegible] Conditioning Exposition
[illegible] Convention Hall
January 26-29

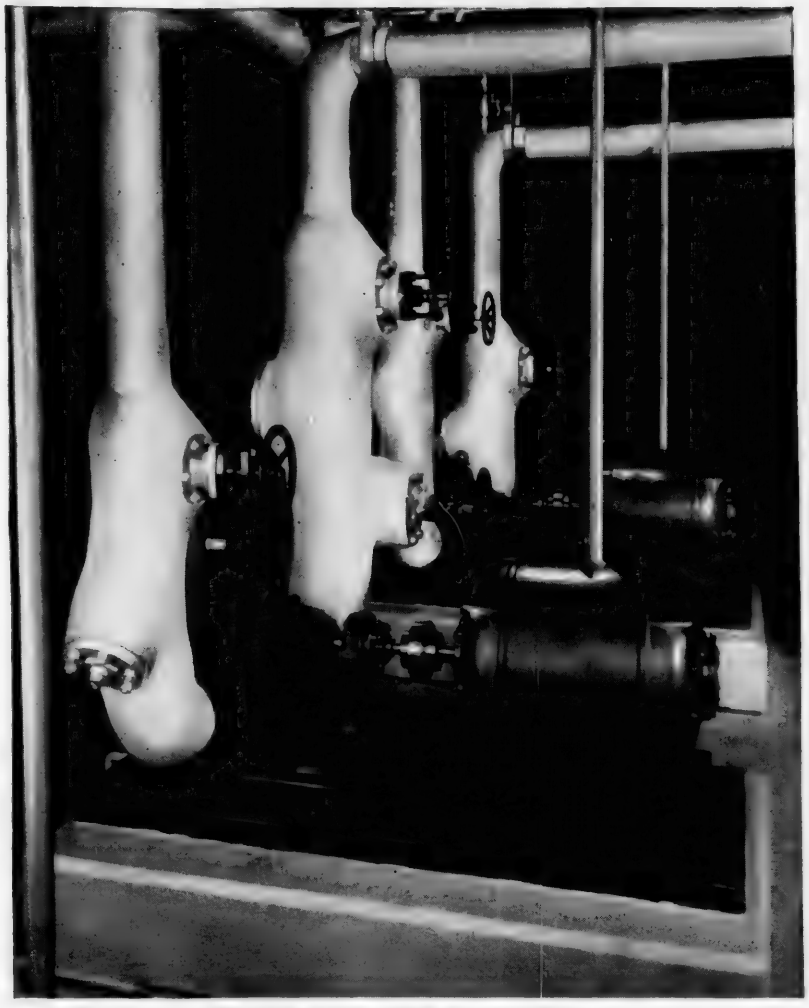
**YORK**

YORK CORP. SUBSIDIARY OF BORG-WARNER CORP.

BW

BORG-WARNER
RESEARCH & ENGINEERING
MAKE IT BETTER

Air Conditioning, Heating, Refrigeration and Ice Equipment • Products for Home, Commercial and Industrial Installations



*"Buffalo" Class "RR" Two-Stage Pumps*

# THEY PUMP MORE WATER AT LOWER COST

TESTIMONIALS from satisfied users prove the outstanding performance record of "Buffalo" Class "RR" Single Suction Multi-stage Pumps. These sturdy pumps are specially designed for high pressure and temperature clear water conditions.

The constant hydraulic balance of the "RR" design is the key to the high efficiencies these pumps deliver on the job. Rugged construction, generous bearings, extra-deep stuffing boxes — all add up to peak performance and long-lived dependability.

"Buffalo" Class "RR" Pumps are available in two and four-stage models, and in a variety of sizes to suit your needs. You will find them a best buy for any clear water service — hot or cold, at pressures up to 1500 ft. heads and at capacities from 20 gpm to 900 gpm.

Your nearby "Buffalo" Engineering Representative will be glad to show you the advantages of "Buffalo" Class "RR" Pumps — or write for Bulletin 980-E.

Every "Buffalo" product brings you the famous "Q" Factor — the built-in QUALITY which provides trouble-free satisfaction and long life.

**BUFFALO PUMPS**

DIVISION OF BUFFALO FORGE CO.

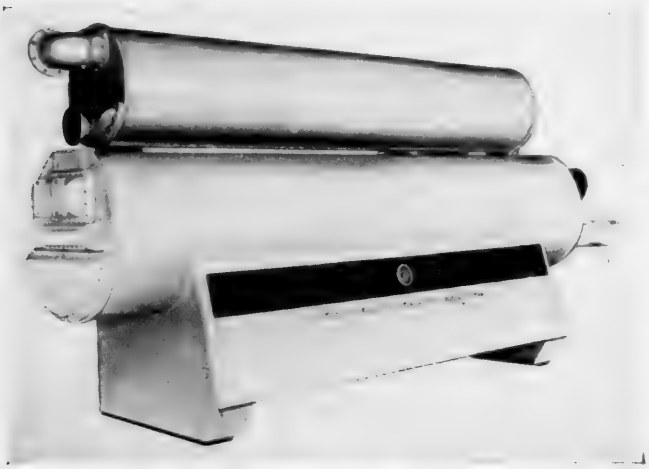
480 Broadway • Buffalo, N. Y.

Canada Pumps, Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

Architects and Engineers: Skidmore, Owings & Merrill



One of the Air Force Academy's two absorption units. Operating on high temperature hot water, they have a capacity of 1400 tons.

**Gas-fired Carrier Automatic Absorption Refrigeration**

- cuts operating expense
- lowers installation cost
- provides quiet, vibrationless operation
- answers space and weight problems
- automatically adjusts to varying loads

# GAS-operated CARRIER

## absorption refrigeration provides trouble-free, economical cooling at the U. S. air force academy

To provide comfort cooling, the new Academy is equipped with the nation's most efficient, up-to-date type of air-conditioning – gas-fired Carrier Absorption Refrigeration.

The absorption refrigeration unit makes use of one of the oldest and most reliable principles of refrigeration. No prime mover is required, only low-pressure steam or hot water. Seasonally idle or excess boiler capacity can be put to use on a year 'round basis.

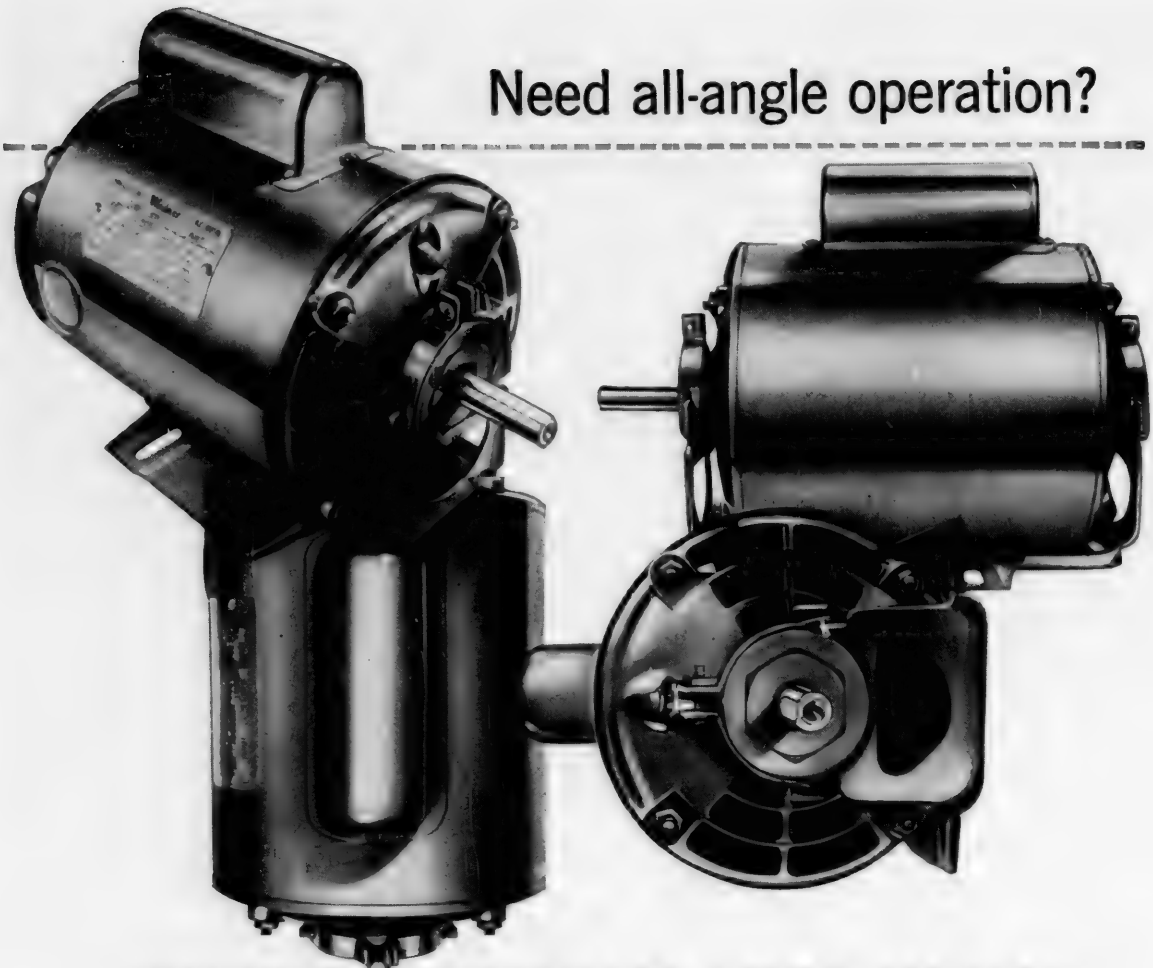
*This same type of automatic operation can put your heating system on a year 'round paying basis, too!*

With gas as the boiler fuel, operating costs are cut to a minimum. This gas-fired Carrier machine operates without noise and vibration . . . and because it is so compact and lightweight, it can be put almost anywhere – from basement to roof.

This is only part of the story of the efficiency and economy of specifying gas-fired Carrier Automatic Absorption Refrigeration equipment. Specific performance, engineering data and cost details are yours for the asking. Just call your local gas company, or write to the Carrier Corporation, Syracuse, New York. *American Gas Association.*

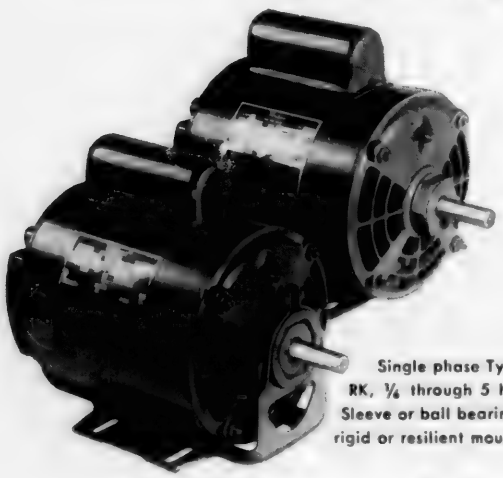
The new United States Air Force Academy perched at 7,200 feet above sea level near Colorado Springs and Pikes Peak, soon to house 1,145 Cadets.

# Need all-angle operation?



# WAGNER CAPACITOR-START MOTORS

**operate in ANY position... provide dependable starting...**
***pack more power into less space!***



Single phase Type RK, ¼ through 5 hp. Sleeve or ball bearing. rigid or resilient mount.

Here's the answer for applications that require angle mounting of fhp motors. Wagner Type RK sleeve bearing motors, in fractional ratings, have a positive lubrication system that permits operation in any position.

You get quick, trouble-free starts—thanks to a Wagner designed quick break switch—and you get more horsepower with less bulk, for a better chance to lick those tough space problems.

You can get these motors from leading motor distributors in your community and from Wagner Sales Offices in 32 principal cities. Your Wagner Sales Engineer will be glad to help you select the right motor for your application. Wagner Bulletin MU-217 gives full details.

WM59-6

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

## Wagner Electric Corporation

6463 Plymouth Ave., St. Louis 14, Missouri.

SERVING 2 GREAT GROWTH INDUSTRIES . . . *ELECTRICAL . . . AUTOMOTIVE*

*International Arrival and Airline Wing Buildings, New York International Airport. The Port of New York Authority, owner, operator, and engineer. Skidmore, Owings & Merrill, architects; Cauldwell-Wingate Co., general contractor; Eugene J. Brandt & Co., Inc., mechanical contractor, all of New York.*

# World's Largest Pneumatic Transmission System Keeps Huge Terminal at Its Air Conditioned Best

Dominating the vast $150 million Terminal City being built at New York International Airport is the new International Arrival Building. With its adjoining Airline Wing Buildings, the structure is 11 city blocks long, contains nearly 700,000 sq. ft. of space! By 1965, it is expected to handle over two million overseas passengers per year.

Passenger *comfort* is on a big scale, too. For example, a specially engineered Johnson Pneumatic Temperature Control System directs 70 heating and air conditioning systems supplying over one-half million cubic feet of conditioned air per minute. Forty-four of these serve Port Authority areas. The others supply spaces leased by foreign airlines.

*Johnson Thermostats keep all points of the building as comfortable as an executive office. Here, passengers pass through customs with supermarket efficiency.*

Nearly 70 *miles* of compressed air piping connect the Johnson pneumatic thermostats, valves and other controls. Utilizing the world's largest pneumatic transmission system, a Johnson Control Center permits Port Authority personnel to supervise their 44 air conditioning systems, check and record room temperatures and make key adjustments—all from a single master panel! Results: an ideal indoor climate for travelers, maximum productivity for building personnel and major savings on heating and cooling costs.

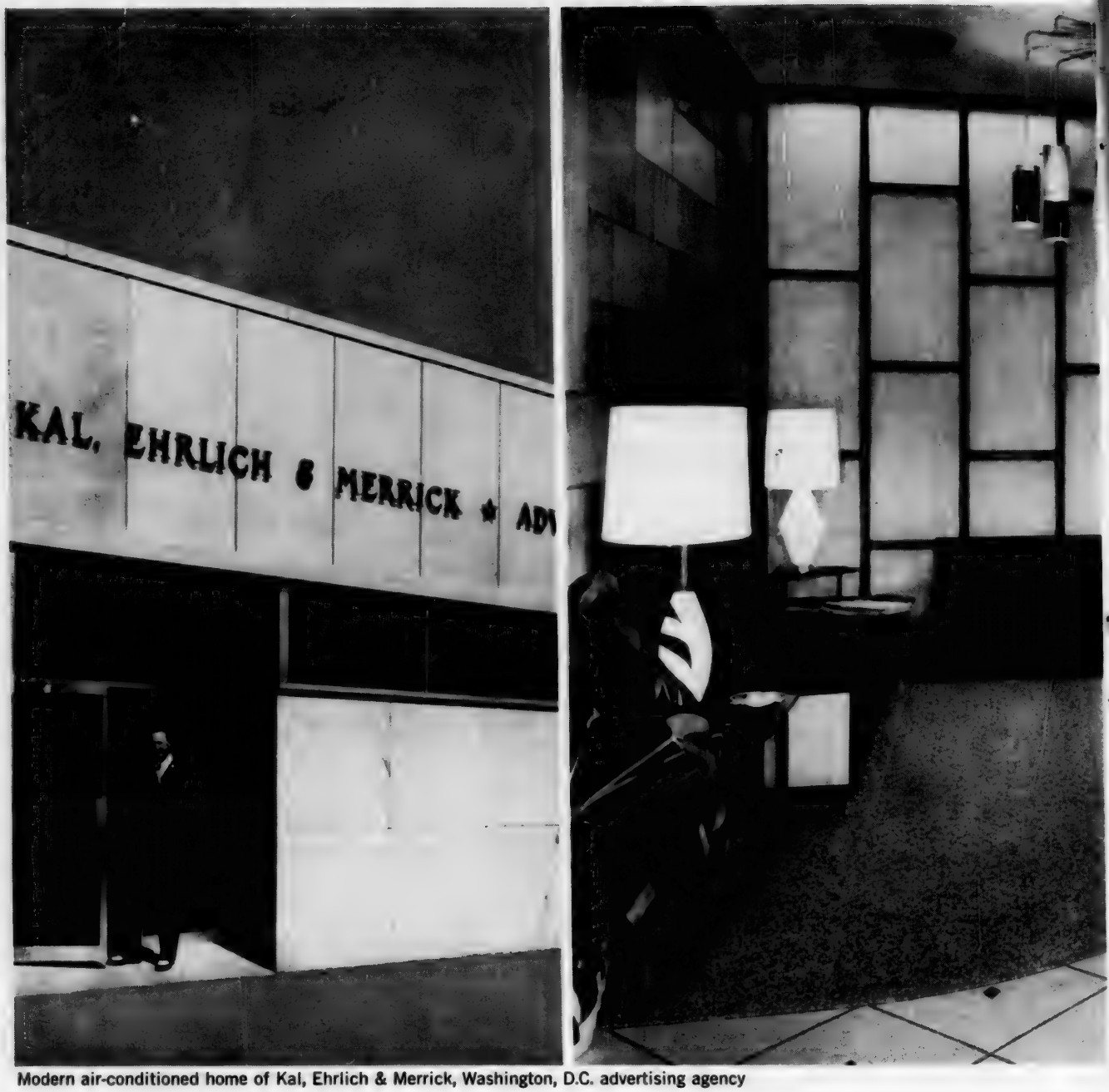
This spacious terminal is one of tens of thousands of fine buildings that are equipped with Johnson Pneumatic Controls. Why not give your clients the same benefits? For immediate help with any temperature control problem, call a nearby Johnson engineer. Johnson Service Company, Milwaukee 1, Wisconsin. 105 Direct Branch Offices.

**JOHNSON CONTROL**

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

TEMPERATURE CONTROL SYSTEMS FOR SCHOOLS, OFFICES, FACTORIES, STORES, HOSPITALS, HOTELS, PUBLIC BUILDINGS



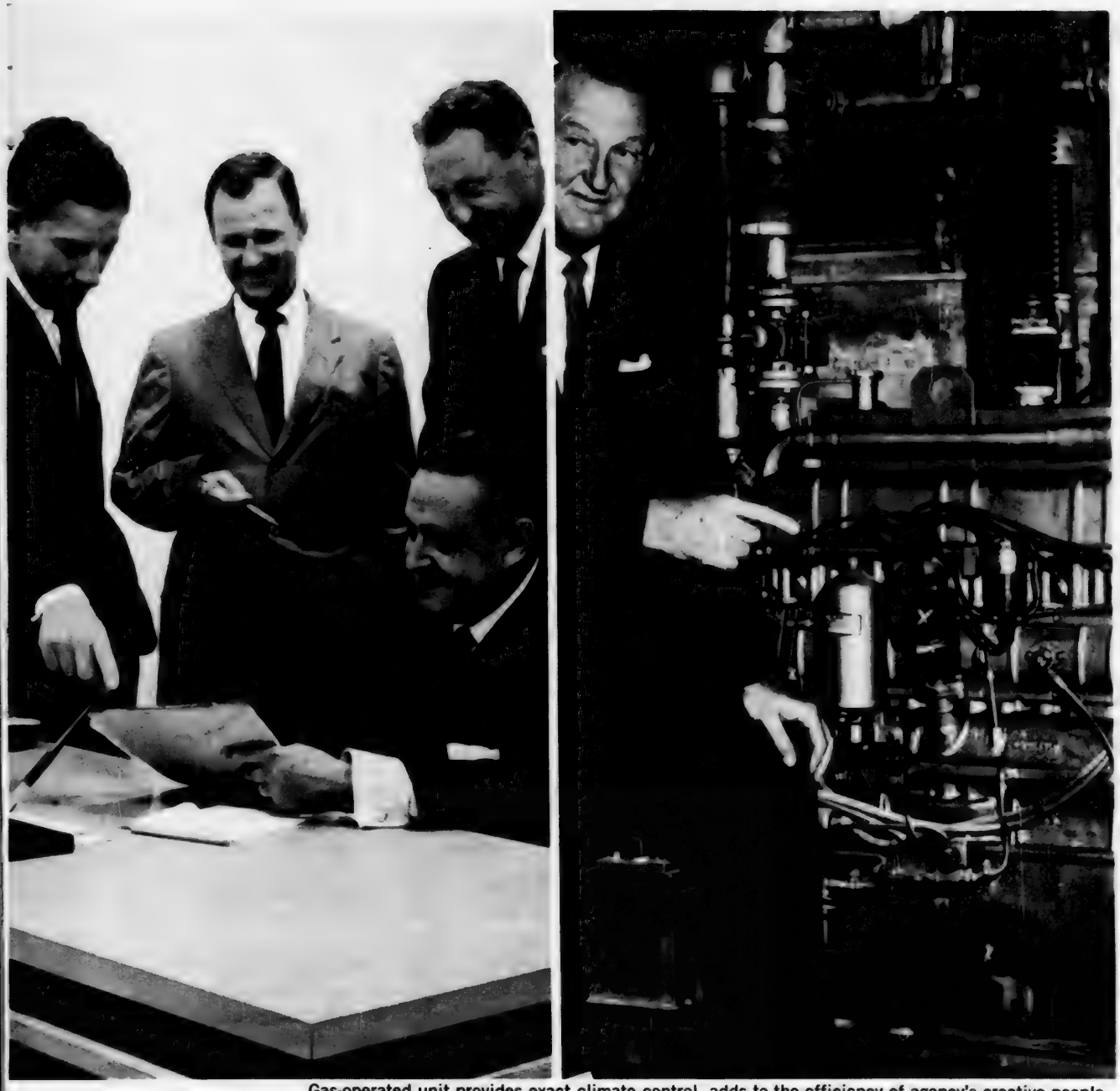

Modern air-conditioned home of Kal, Ehrlich & Merrick, Washington, D.C. advertising agency

## "Nothing to do—but enjoy it, with our all-

*Says Harry L. Merrick, Sr. President,*
*Kal, Ehrlich & Merrick Advertising Agency*

"Only the best air conditioning system would do for our new building, and experience proves the best is definitely gas", continues Mr. Merrick. "Our Ready-Power air conditioner gives us the exact climate control we want every day of the year . . . and it's extremely inexpensive to operate."

Ready-Power's exclusive variable speed operation offers *constant, precise* control of humidity and temperature without the variations common to on-off systems.



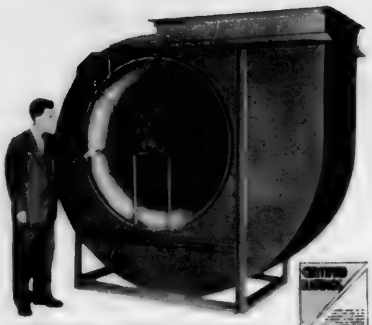
Gas-operated unit provides exact climate control, adds to the efficiency of agency's creative people.

## year READY-POWER GAS air-conditioning!"

Because they combine the outstanding economy of gas fuel with automatic metering to match the load on hand, Ready-Power units have the lowest known operating costs . . . *less than a penny per ton per hour!*

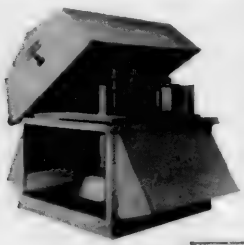
For information on how you can benefit by installing modern Gas air conditioning equipment, call your Gas Company's commercial specialist or write to the Ready-Power Company, Detroit 14, Michigan. *American Gas Association.*

**PVB**—generally used in factories, warehouses and foundries.



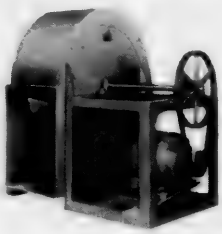
**BACKWORD CURVE CENTRIFUGAL BLOWERS** for schools, churches, public buildings, industrial plants, etc.

**PVS**—quiet for schools, churches, auditoriums, etc.

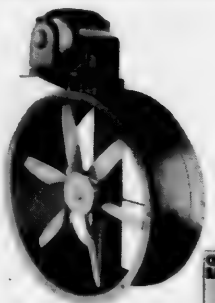


**CENTRIFUGAL POWER ROOF VENTILATOR**—for auditoriums, schools, churches, public buildings, plants.

**PROPELLER-TYPE ROOF VENTILATOR**—for apartments, plants, schools, etc.



**BACKWARD CURVE BELT DRIVE UTILITY BLOWER**—recommended for general ventilation.



**DUCT or TUBAXIAL**—for paint spray booths, etc. —explosion-proof.

# *Peerless Electric*® and the Massachusetts Line®*

## AIR MOVING EQUIPMENT

***is designed for low initial cost and continuous, trouble-free performance.***

**P**eerless Electric air moving equipment offers the user low initial cost and trouble-free, continuous performance. Each unit is completely Peerless built. Motors are designed, engineered and manufactured in the Peerless Electric Motor Division. They are made to N. E. M. A. specifications and performance-matched to the fans or blowers they must power.

**E**ach Peerless Electric unit indicated with the AMCA seal is rated by the new Air Moving and Conditioning Association. Installation data, performance tables, dimensions, ratings, general construction data, recommended specifications, and guarantee information are all available in the new Peerless Electric catalogs. Write for a complete set today.

*The Massachusetts Line® is now manufactured by The Peerless Electric® Company

***A COMPLETE LINE OF AIR MOVING EQUIPMENT***

Member of the Air Moving and Conditioning Association, Inc. (AMCA)

Peerless Electric

FAN AND BLOWER DIVISION

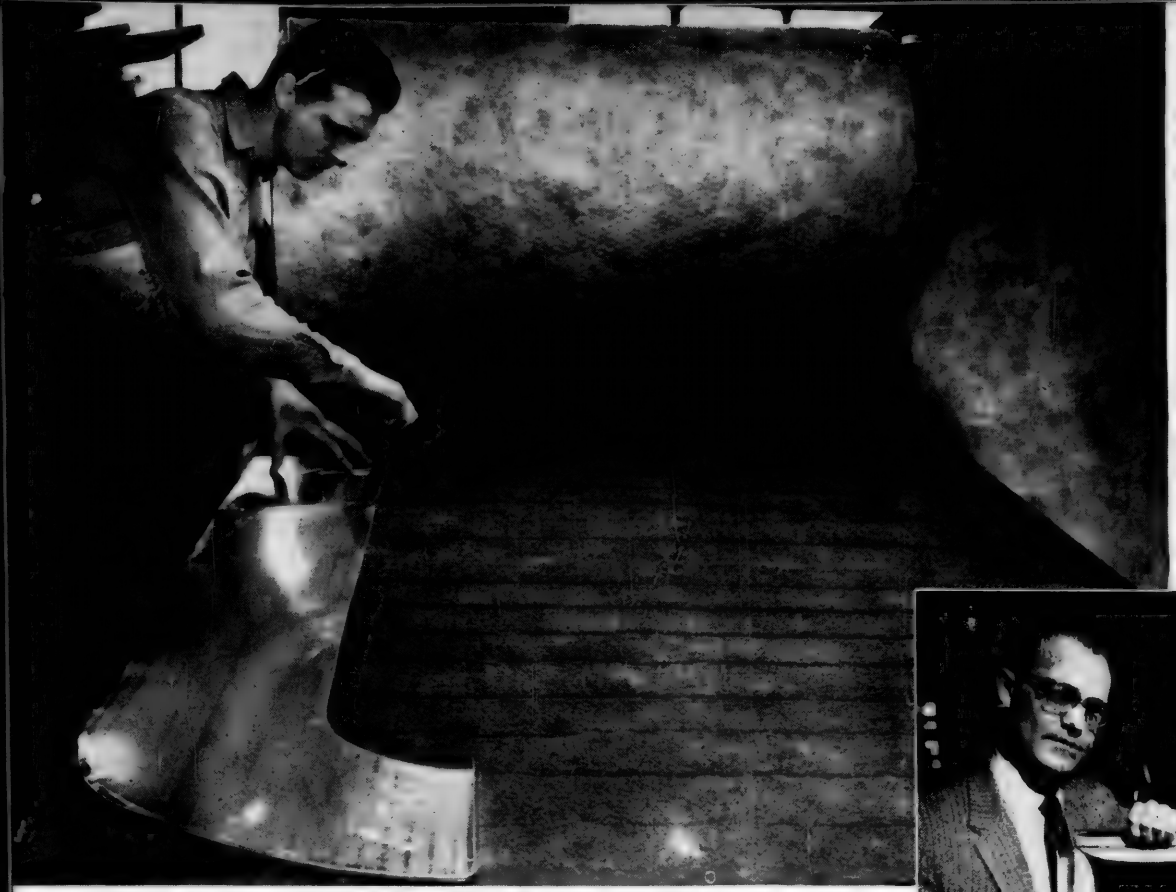
THE *Peerless Electric*® COMPANY

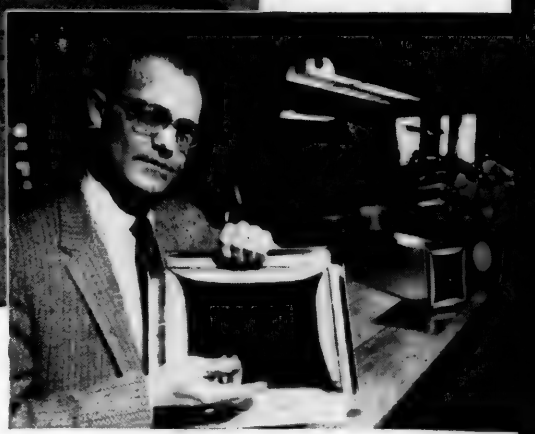
1400 W. MARKET ST. • WARREN, OHIO

FANS • BLOWERS • ELECTRICAL MOTORS

Locate Your Nearest Representative in the "Yellow Pages"

SEE OUR CATALOG IN SWEET'S





Pittsburgh Superfine is quickly cut to correct size with a knife. Cut sections are then bonded to duct with adhesive. Extra adhesive is applied to edges of insulation to adhere them to edges of metal.

"We used one-inch, 1½-lb. density Pittsburgh Superfine Fiber Glass Insulation with a Neoprene coating to line all ducts," says Mr. George P. Fenton. "Superfine is flexible, adaptable and easy to handle."

# At Greater Pittsburgh Airport's New Extension— Pittsburgh Superfine Insulates Air Conditioning Duct Work

"When our company installed the sheet metal ducts for the two air conditioning systems at Greater Pittsburgh Airport's new East Dock, we used over 7,000 sq. ft. of Pittsburgh Superfine Fiber Glass Insulation as the acoustical and thermal lining for the ducts," reports Mr. George P. Fenton, General Manager, McIlroy Sheet Metal Engineers and Fabricators, Pittsburgh, Pennsylvania.

## Why Pittsburgh Superfine was specified

"This job called for an insulation that could withstand air velocities, would have proven erosion resistance, would provide good acoustical properties at minimum cost, and would insure resistance against temperature differential. Pittsburgh Superfine met all these requirements easily."

## Easy to work with on the job

"We've used Pittsburgh Superfine often, and know from experience that it's flexible, adaptable, easy to handle and easy to cut. It's especially adaptable for use in irregularly curved ducts. There was not a single installation problem on the airport job that we could not handle with Superfine," concluded Mr. Fenton.

## Pittsburgh Superfine Fiber Glass can help you, too!

It's rot proof, fire-resistant . . . and it's the finest insulation against heat, cold or noise you can get! Available in a variety of facings to meet your needs. For complete information, write to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pa.*

**PITTSBURGH SUPERFINE IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY**

Sales offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, Minneapolis, New York, Philadelphia, Pittsburgh and St. Louis

FIBER PG GLASS PITTSBURGH · PLATE GLASS COMPANY

# TRANE ANNOUNCES

# new compressor design...for R-22 or R-12 and air condensing!

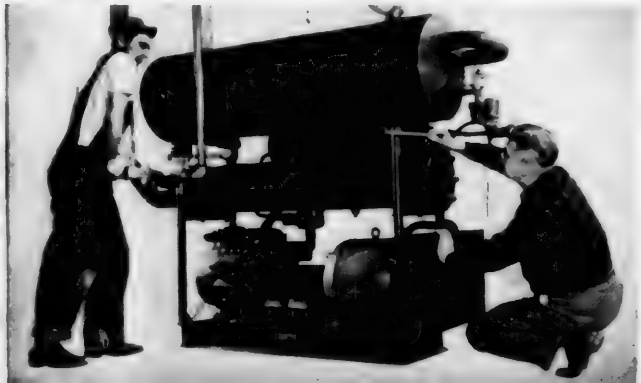
*8 exclusive design features assure easy servicing, increased dependability and smoother operation*

Here's the biggest advance in compressor design in years! It's the TRANE Reciprocating Compressor—the only unit especially designed for use with either R-22 or R-12 refrigerant. Available with air condensing, it has many new, exclusive features that increase its dependability and operating smoothness. Heart of the famous TRANE Cold Generator and TRANE heavy duty Self-Contained Air Conditioners, this is the same outstanding compressor that has been recognized as a leader in the field—and now it is better than ever! Here are some of the advanced design features:

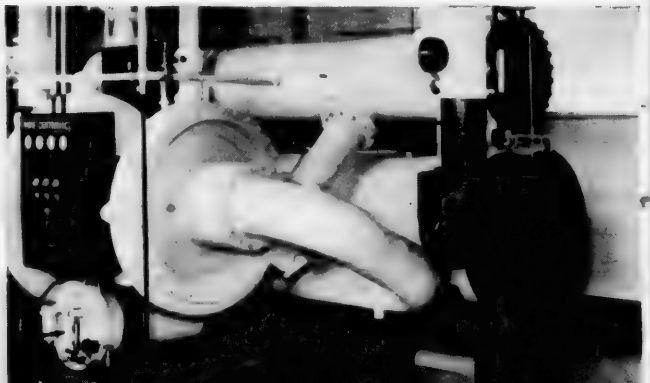
- **Designed for R-22**—Compressor specifically designed for the higher operating pressures of R-22.
- **Higher condensing temperatures**—up to 140° F. with R-22, or 150° F. with R-12. Available with air or water condensing.
- **Every part accessible**—quickly, easily. Even the valves, strainer and cylinder liners are easily accessible. Entire compressor can be disassembled, if necessary.
- **Slugging problem reduced**—Large suction chamber and cylinder head safety springs protect the discharge valves in case of oil or liquid slugging.
- **Improved lubrication**—Extra large oil pump, with two forced-feed crankshaft lines. Centrifuge action and three magnetic plugs insure cleanliness.
- **New valves**—Exclusive super-hard valve plating for longer wear; does not absorb and hold dirt.
- **Simplified construction**—Staggered cylinders; fewer bolts, gaskets and parts. All internal parts except crankshafts are interchangeable.
- **Less starting and stopping**—Multi-step capacity control reduces starting, stopping, saving in power cost, adding years of life.

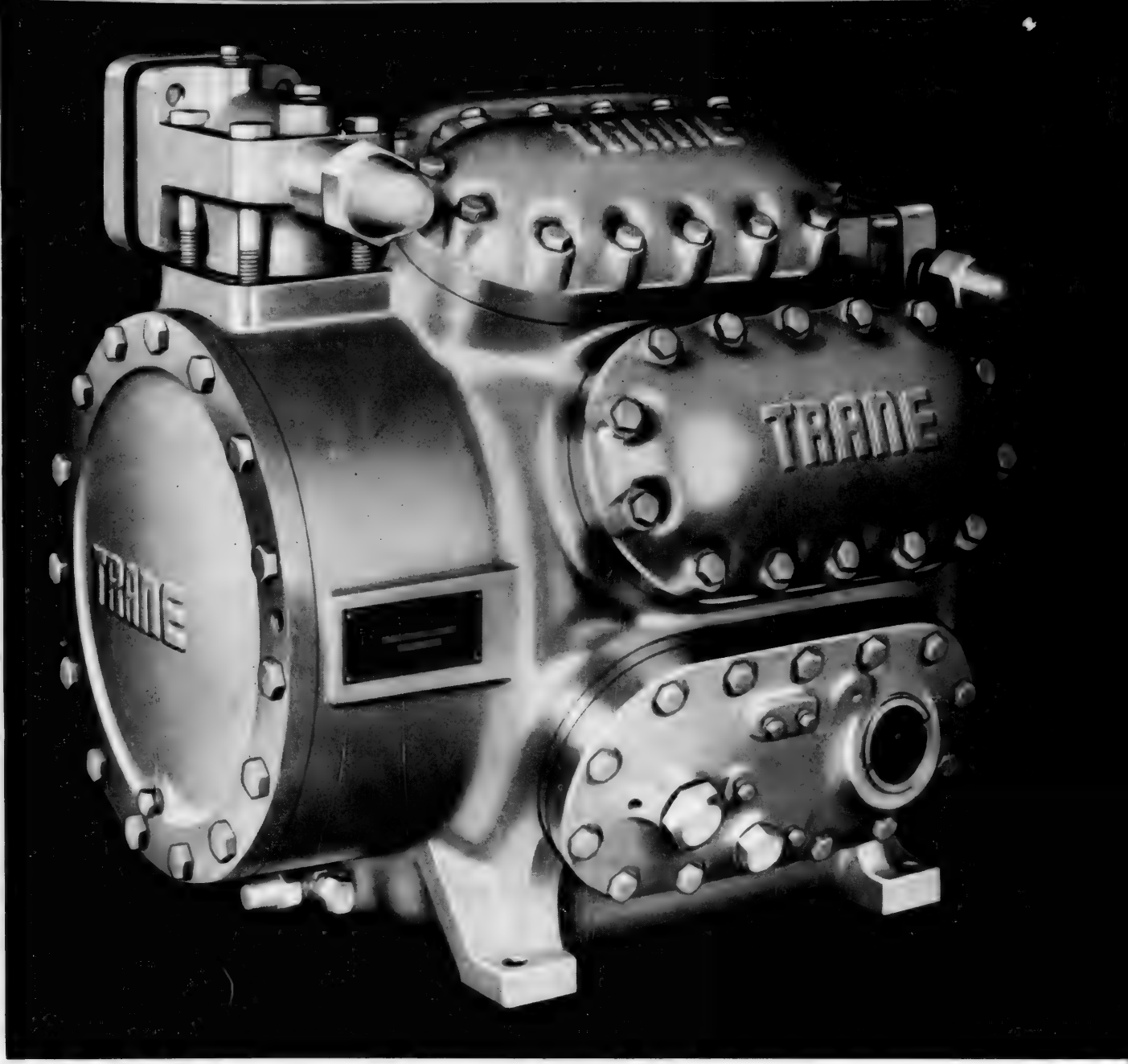
Next time you're planning an air conditioning job, call on TRANE for the refrigeration equipment you need. A nationwide sales and service organization is available to help you choose the units that are right for the job.
Call your nearby TRANE Sales Office—or write TRANE, La Crosse, Wisconsin.

**TRANE Cold Generator** provides a packaged water chiller in sizes to 150 tons. 4-step compressor modulation cuts power consumption. Complete factory pre-assembly, including automatic control panel, cuts installation time and cost.



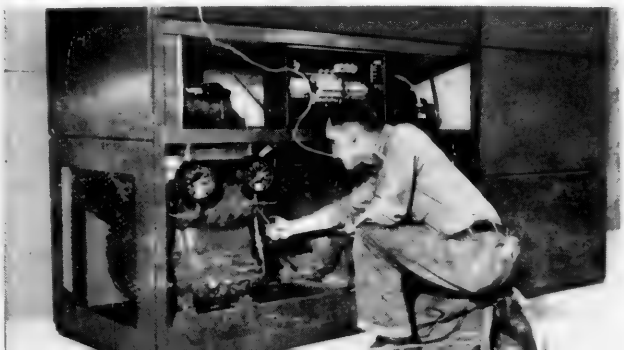
**CenTraVac Water Chiller** now available in steam driven models—open or hermetic design. Hermetic electric type automatically modulates to 10% of capacity—or lower—with power savings in almost direct proportion to load.






Designed especially for use with either R-22 or R-12 and air condensing, this newly-designed reciprocating compressor is now standard in the TRANE Cold Generator and in the TRANE commercial size Self-Contained Air Conditioners. 15, 20, 25 and 30-ton sizes.

**Self-Contained Air Conditioners** may be installed within or outside conditioned zone. 3, 5, 7, 10 and 15-ton capacities in deluxe models; 10, 15, 20, 25 and 30-ton commercial models (illustrated)—all available with air or water cooling.



***For any air condition, turn to***

# TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA. • CLARKSVILLE MFG. DIV., CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA, LIMITED, TORONTO • 97 U. S. AND 19 CANADIAN OFFICES

# "WE SECURED EVEN TEMPERATURES THROUGHOUT THIS 14-STORY BUILDING WITH SARCOTHERM HEATING SYSTEM CONTROLS,"

*say Slingerland and Booss, architects and engineers*

New York's "Avon House," completed in 1957, Architects and Engineers: Slingerland and Booss, 120 Greenwich Street, N. Y. C.

Mechanical Contractors: Fein-Schlosberg, Inc., 1770 Second Avenue, N. Y. C. Owner: The Ten Men Realty Co., Leon Finley, President, N. Y. C.

In the superbly appointed "Avon House" apartments at 340 East 74th Street, New York, the complete automatic heating control job is Sarcotherm. The architects and engineers, Slingerland and Booss, called on Sarco's experienced engineering department to work with them and the mechanical contractor in working out components—controls, vacuum pumps and steam specialties. Besides setting up undivided responsibility of one manufacturer, this policy assured a balanced system with no weak links.

Accurate orifice calculations by Sarcotherm insured proper distribution of subatmospheric steam in the system, even in mild weather. Each of the 2 zones of this building is controlled by a Sarcotherm Continuous Flow Modulating Steam Control Valve. These valves meter the steam to furnish proper heat at any given outside temperature. Control Valves are influenced by outside temperature, wind velocity, and solar radiation, plus differential steam pressure between supply and return mains. A Master Control Panel supplies complete programming operation with automatic control for day, night and morning pickup cycles.

There is ample testimony to the sound judgment of the architects in making this a complete Sarcotherm vacuum heating control system. Since its first day of operation the installation at the new Avon House has been 100% trouble-free.

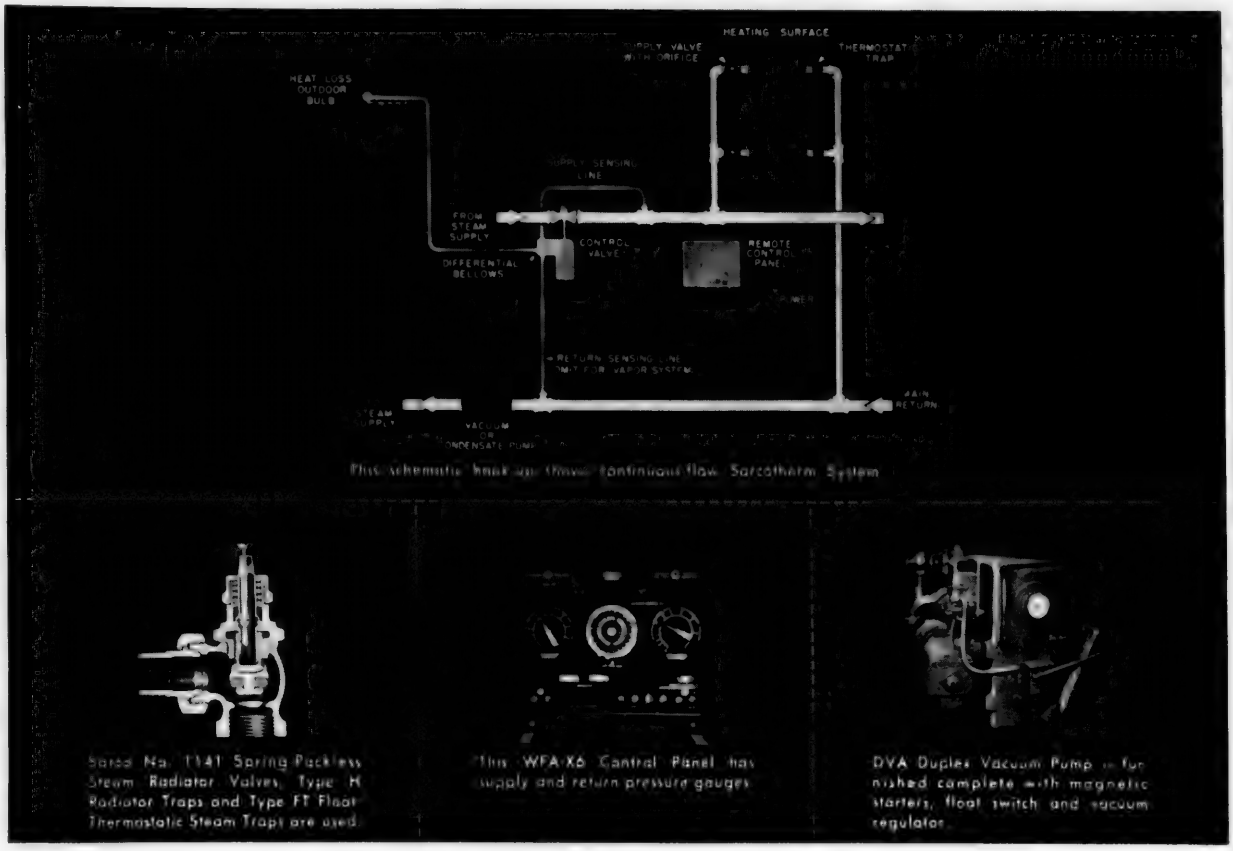
**SARCOTHERM**

*An Affiliate of SARCO Co., Inc.*

635 Madison Avenue, New York 22, N. Y.

6181-B

# "INSTALLATION WAS EASY, THANKS TO SARCOTHERM ENGINEERING SERVICE AND UNDIVIDED RESPONSIBILITY FOR CONTROLS, SPECIALTIES, PUMPS," *say Fein-Schlosberg, Inc., mechanical contractors*


HEATING SURFACE
SUPPLY VALVE WITH ORIFICE
THERMOSTATIC TRAP
HEAT LOSS OUTDOOR BULB
SUPPLY SENSING LINE
FROM STEAM SUPPLY
CONTROL VALVE
REMOTE CONTROL PANEL
DIFFERENTIAL BELLOWS
POWER
RETURN SENSING LINE
MAIN RETURN
STEAM SUPPLY
VACUUM OR CONDENSATE PUMP
This schematic hook-up shows continuous flow Sarcotherm System
Sarco No. 1141 Spring Packless Steam Radiator Valves, Type H Radiator Traps and Type FT Float Thermostatic Steam Traps are used.
This WFA-X6 Control Panel has supply and return pressure gauges
DVA Duplex Vacuum Pump is furnished complete with magnetic starters, float switch and vacuum regulator.

*Marked advantages were found by the mechanical contractors in the quality of orifice engineering provided by Sarcotherm. Every valve, for example, was calibrated and the orifice plate brazed in at the factory. All units were tagged, unit-packaged, and keyed in with the hook-up drawing. The installation was supervised by Sarcotherm engineers. The installation was rapid and easy. No on-the-job adjustments were necessary.*

**SARCOTHERM**

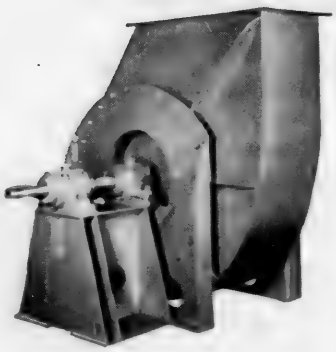
*An Affiliate of SARCO Co., Inc.*

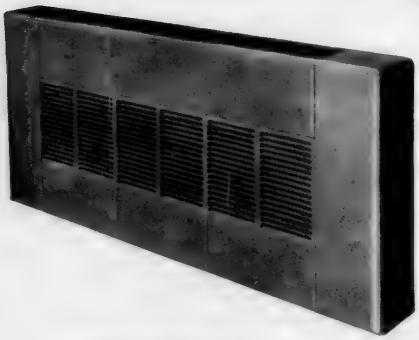
*

*FOR COMPLETE CONTROL SYSTEM CATALOG*
write Sarcotherm Controls, Inc.,
635 Madison Ave., New York 22, N. Y.

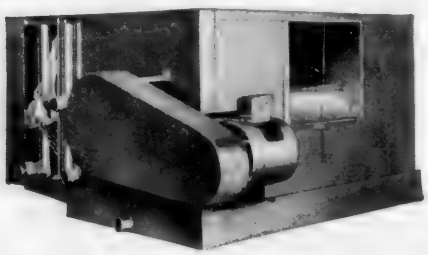
6176 B

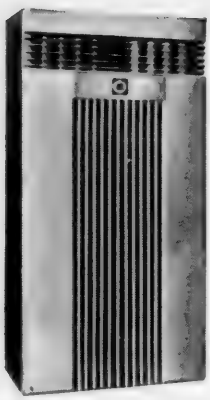
High-Pressure Fans are part of the complete American Blower package for high-velocity, high-pressure air-handling systems.





Planning a peripheral system? Compact American Blower Inductor Units can be mounted vertically or horizontally.

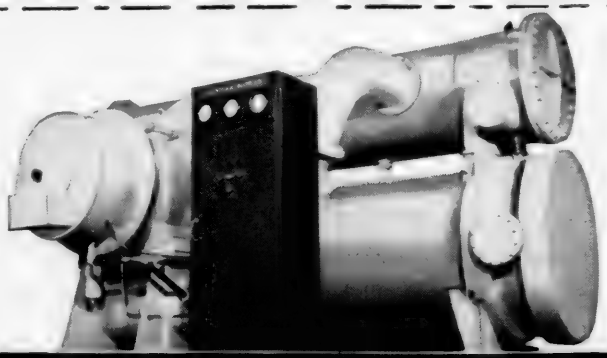




American Blower Type A Conditioners provide control of summer cooling and winter heating for central-station air-conditioning systems.

Air or water cooled American Blower Packaged Air Conditioners are self-contained units that cool, filter, dehumidify, circulate. For stores, showrooms, factories. Complete range of sizes.

Planning a central-station system? American Blower Tonrac® Centrifugal Refrigerating Machines maintain constant chilled-water temperature regardless of load. One-level construction saves weight, space, installation costs.



# Here's how you benefit when you select all your air-conditioning components from American Blower's complete line:

**American Blower cooling, heating, air-handling and air-conditioning products are designed, engineered, manufactured to work together!**

When choosing air-conditioning equipment — for a large-scale central or zone system, or a system for a smaller store, showroom or industrial plant — it pays to select from one source. A single source pinpoints responsibility for quality, performance, delivery dates . . . saves time and money.

### Complete line fits all requirements

The components shown opposite are only a few of the complete line of American Blower quality air-conditioning products, designed, engineered and manufactured to work together. Refrigerating machines, heating and cooling coils, central-station air-conditioning units, multi-zone conditioners, inductor units, sprayed-coil dehumidifiers, self-contained air conditioners, heavy-duty fans, equipment for heating, cooling, dehumidifying . . . whatever your needs, specify American Blower for undivided responsibility!

### Expert service before, during and after the sale

The more than 300 skilled American Blower factory and sales engineers in all parts of the country are at your service. Each has the know-how and experience to help you select and apply the exact American Blower equipment you need. And what's more, they'll follow-through during and after the installation to ensure your satisfaction.

### Performance-proved by 77 years' experience

American Blower's 77 years' experience as a leading producer of air-conditioning, air-handling, cooling and heating products is your guarantee of a successful installation every time, and your client's assurance of years of trouble-free air conditioning. American Blower products have proved dependable in thousands of important installations in all parts of the world.

Get in touch with our nearest branch office for full information, or write: American-Standard,* American Blower Division, Detroit 32, Mich. In Canada: Canadian Sirocco products, Windsor, Ont.

**See our exhibit, Booths 44, 46 and 48, at the 14th International Heating and Air Conditioning Exposition, Convention Hall, Philadelphia, Pa., January 26-29, 1959.**

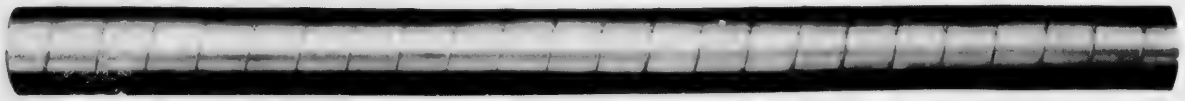
* American-Standard and Standard ® are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard

AMERICAN BLOWER DIVISION

# SPECIALISTS IN LOW LOSS COMPONENTS FOR HIGH VELOCITY SYSTEMS

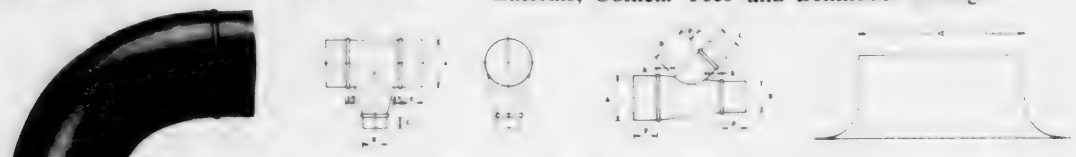
## ✳SPIRAL *Lockseam* DUCT



- Diameters: 3", 3¾", 4", 5", 6", 7", 8", 9", 10", 11", 12", 14", 16", 18", 20", 22"
- Furnished In Any Lengths Up To 20' As Continuous Duct — 12' Lengths Are Standard
- Machine Made to Perfect Roundness. Four-Ply "Lockseam" Spiral Ribbing Structure Maintains The Roundness By Stiffening
- Ribbing Stiffens Duct With Less Deflection Between Suspending Hangers, Insuring A Straight Air Path
- Installations Can Be Assembled With Far Fewer Than The Standard 40 Joints Per 100 Feet
- Manufactured Of Premium Grade Rust Resistant Galvanized Sheet. Spiral "Lockseam" Duct Has No Coating Irregularities

## ✳LOW LOSS FITTINGS

Die-Stamped "Laminar-Flo" 90° Elbows, Laterals, Conical Tees and Bellmouth Fittings



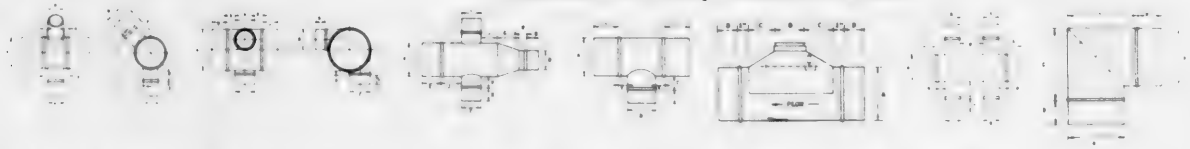
Machine-Made, Mass-Produced, Two-Piece 90° Elbow, Type E-1

- 3", 4", 5", 6", 7", 8" Diameters
- 20 Ga. Galvanized Steel
- Continuous Weld

Now you can specify 90° elbows with consistent and predictable performance characteristics. United's "Laminar-Flo" die-stamped 90° elbows have been thoroughly tested. They markedly reduce friction loss in high velocity systems, and are a logical replacement for hand-made segmented elbows.

## ✳STANDARD FITTINGS

Elbows, Tees, Crosses, Dampers, Couplings, Reducers, End Caps, Square-to-Round Tap Connections Available For Every Diameter Of Duct



## ✳SOUND ABSORBERS

High Pressure — Low Friction Loss. Designed Especially For High Velocity Air Systems

New Catalogs, Friction Loss Chart Manual, and Complete Testing, Engineering and Installation Data Available On Request. Write to Dept. 101

Representatives At:
14th International
Heating & Air Conditioning Exposition
Booths #818 — 820
January 26-29 Philadelphia

**spiral pipe division**
**United**
**SHEET METAL COMPANY, INC.**
**COLUMBUS, OHIO**

# We Point with Pride to. . . . 25

As we enter our twenty fifth
anniversary year, we are proud...
proud not for ourselves,
but for the quarter of a century
of trust, patronage
and loyal support from you,
the Wholesalers, Manufacturers,
Service Engineers,
Contractors, Architects and
Engineers in the
Air Conditioning and
Refrigeration Industry...
without whom, this
would not be possible.

**SPORLAN** VALVE COMPANY
ST. LOUIS 17 MISSOURI

. . . 1934-1959

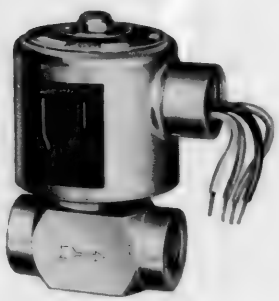
*but...* **PROUD AS WE ARE...**

# *Sporlan*

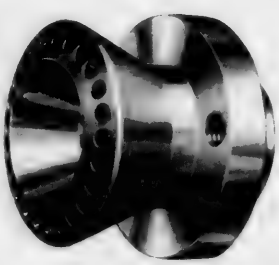
**will develop and produce only**

## *PEAK PERFORMANCE PRODUCTS*

**to fulfill the needs of the Refrigeration and Air Conditioning Industry**



Sporlan will continue to expand and perfect its combination of right down the line Peak Performance Products . . . the Catch-All filter-dryer, the See-All moisture and liquid indicator, Solenoid Valves, Thermostatic Expansion Valves, Refrigerant Distributors and the Level-Master control for any commercial or industrial Air Conditioning or Refrigeration job.



We are expecting you at **BOOTH 52**

14TH INTERNATIONAL HEATING and AIR CONDITIONING EXPOSITION
JANUARY 26-29, 1959
CONVENTION HALL
PHILADELPHIA, PA.

*Buy Sporlan Right Down the Line and get Peak Performance throughout!*

**SPORLAN VALVE COMPANY**
7525 SUSSEX AVE. ST. LOUIS 17, MO.
EXPORT DEPT. 85 BROAD STREET, NEW YORK 4, N. Y.

*Our 25th Anniversary.....1934-1959*

LITHO IN U.S.A.

# They compared "K" factors and cost factors ...and bought SNAP*ON®

**Here's how <u>you</u> can save installation costs on fittings** — simply use Snap*On, the original one-piece pipe insulation molded of fine glass fibers. Nothing could be easier than insulating bends, valves and fittings with cut-and-mitered Snap*On — and you get a neat job, uniform in thickness.

On straight lines, too, no pipe insulation is so economical to apply as Snap*On — just spread the single seam and it snaps over pipe. In thermal efficiency Snap*On rates at the top of all general purpose pipe insulations on the market today. But make a cost comparison yourself by asking your G-B Snap*On distributor for a TEVA (Thermo-Economic Value Analysis) survey the next time you insulate piping. You'll find that for economy, for performance, for permanence, there is *nothing* like Snap*On!

**FOR FREE TEVA SURVEY CALL YOUR LOCAL G-B SNAP*ON DISTRIBUTOR (LISTED IN YELLOW PAGES)**

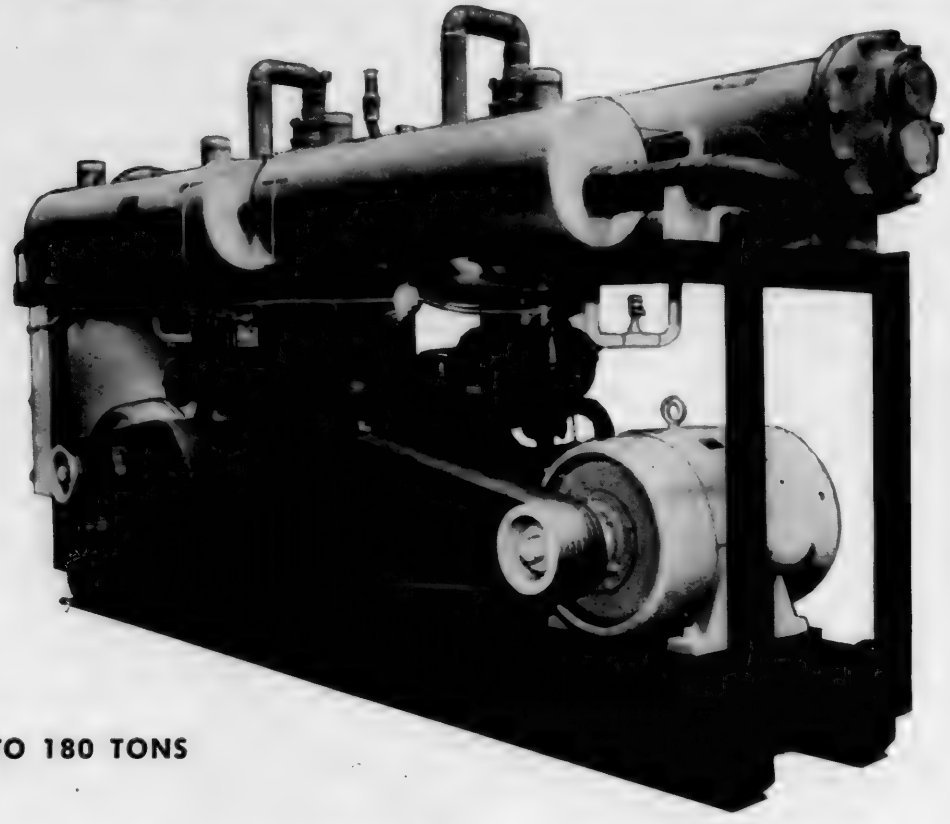
**GUSTIN-BACON** *Manufacturing Co*

**222 W. 10th St., Kansas City, Mo.**

Thermal and acoustical glass fiber insulations . . . molded glass fiber pipe insulation
Plain and grooved end couplings and fittings

# SEE BOOTH 309 INTERNATIONAL HEATING & AIR CONDITIONING EXPOSITION

# THE FRICK PACKAGED WATER CHILLER



20 TO 180 TONS

## COMPACT • AUTOMATIC • EASILY INSTALLED

**A COMPLETELY ENGINEERED, PACKAGED LIQUID CHILLER . . . INCORPORATING ALL OF THE COMPONENTS IN ONE UNIT.**

Each chiller is factory-assembled on a rigid steel base, balanced, and tested, ready for easy installation. Refrigeration is supplied by the famous Frick "ECLIPSE" compressor, with condenser-receiver. Machines handle either refrigerant 12 or 22. Automatic controls adjust the liquid supply and compressor capacity to assure economical operation at all times. Safety features such as oil-pressure switch, high-low pressure cut-outs, freeze-up control on chiller, and two-stage thermostat for automatic regulation of liquid and compressor, are all standard on Frick liquid chillers.

WRITE FOR FRICK BULLETINS 802 AND 804

**FOR COMPLETE DATA . . . facts and figures, call your nearest Frick Branch or Distributor. Consult the Yellow Pages of your phone directory, or write direct to . . . . . .**

DEPENDABLE REFRIGERATION SINCE 1882

**FRICK CO.**

WAYNESBORO, PENNA., U. S. A.

# this is the shape of progress in centrifugal fans

**The Shape of Progress is—AIRFOIL!**

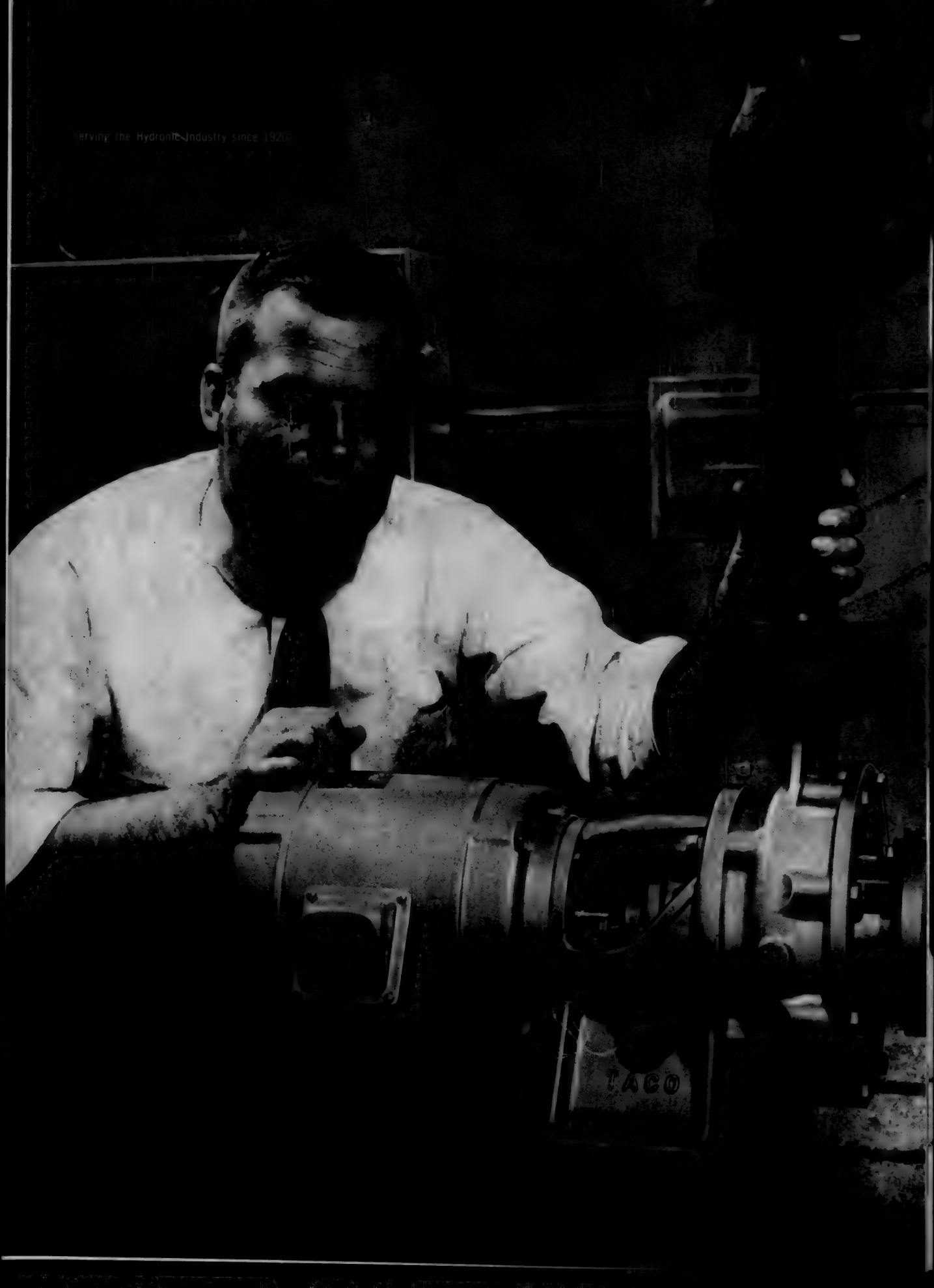
Only Westinghouse offers *you* the effectiveness and quietness of Airfoil Blading in a complete line of centrifugal fans sized to AMCA (NAFM) Standards.

Westinghouse offers these *bonus benefits* in capacities up to 700,000 cfm and four AMCA pressure classes up to 16¾" pressure:

- **Lowest Operating Cost**
- **Quiet Operation**
- **Capacity Protection**
- **Non-Overloading Power Feature**

To take advantage of this *exclusive* offering, call your nearest Sturtevant Division Sales Engineer, or write Westinghouse Electric Corporation, Department A-6, Hyde Park, Boston 36, Massachusetts.

J-80666


TACO

# NEW from TACO

## A LINE OF SINGLE STAGE CENTRIFUGAL PUMPS YOU DESIGNED!

On-the-job discussions with hydronic engineers, contractors and O.E.M. system designers — men who know what's needed in a pump — were basic factors in the final design and performance features of the new Taco LP pumps!

Here stated generally are the main features: rugged design; relatively few sizes; broad range of performance; high efficiencies; interchangeability of parts; available with stuffing boxes or mechanical seals. Also with special motor for extra quiet operation. For the specifics of this dynamic new pump series, write today for the Taco LP Pump Catalog.

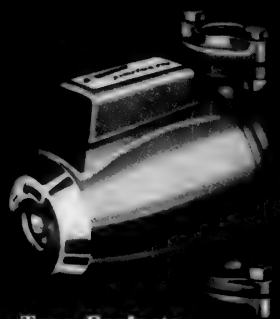
Now, as in the past, "NEW from TACO" means the latest in better products for better pumping installations.

**TACO**

**HEATERS, INCORPORATED**

1160 CRANSTON STREET, CRANSTON 9, RHODE ISLAND

Corporate Office: 342 Madison Avenue, New York 17, New York
In Canada: Taco Heaters of Canada, Ltd., 4 Gilead Place, Toronto 2



**Taco Perfecta:** the world's finest circulator; so quiet you won't believe it's running!

**Taco Circulators:** packed with quiet power and proven performance; sizes ¾" through 3"

**Taco 170 Centrifugal Pumps:** perfect for cooling tower jobs, air conditioning installations — wherever a small, top-quality centrifugal pump is needed.

# CLARAGE

*ARCHITECTS:*
*Harrison & Abramovitz, New York, N.Y.; A. G. Odell, Jr., & Associates, Charlotte, N.C.*
*ENGINEER:*
*Jaros, Baum & Bolles, New York, N.Y.*
*GENERAL CONTRACTOR:*
*J. A. Jones Construction Co., Charlotte, N.C.*
*MECHANICAL CONTRACTOR:*
*Hicks & Ingle Co., Charlotte, N.C.*

## *Another outstanding new building uses Clarage Fans*

**WACHOVIA BANK & TRUST COMPANY**

Attractive — both inside and out — is this newcomer to the Charlotte, North Carolina skyline.

Concrete "curtain walls" give the exterior a distinctive beauty; Clarage Fans give the interior a pleasant atmosphere.

Chosen for the air handling assignment were ten Clarage Type NH system fans and eight Clarage Ready Unit ventilating sets. Prompting this selection: Clarage's recognized ability to perform quietly, economically, *dependably.*

Make sure your investment in air handling and conditioning equipment is a profitable one. Investigate the *quality* line we manufacture for buildings of all types, all sizes.

*Dependable equipment for making air your servant*

## CLARAGE FAN COMPANY

*Kalamazoo, Michigan*

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

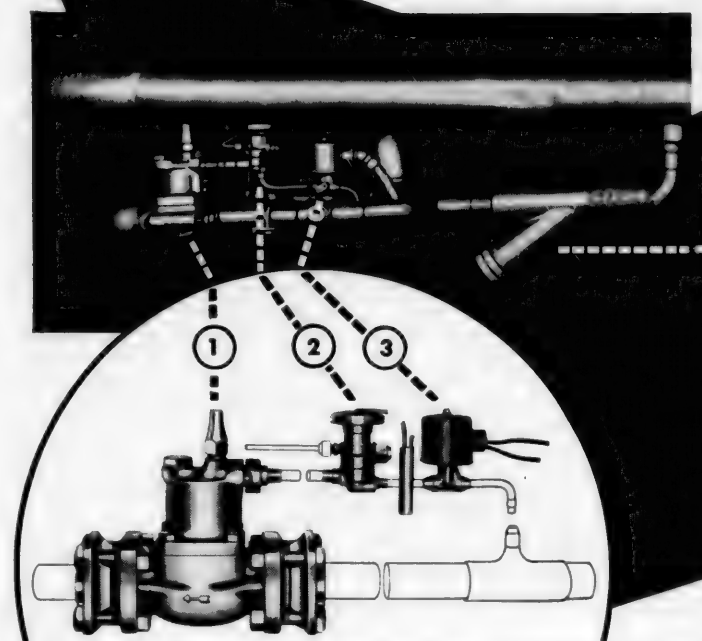
# WHETHER POWERED BY GAS OR ELECTRIC

*specify*

EFFICIENT, POSITIVE ACTION

# ALCO

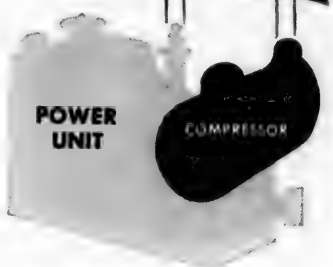
REFRIGERANT CONTROLS




1 ALCO P.O. VALVES—designed and engineered specifically for wide load applications—particularly recommended for refrigeration systems having compressor capacity reduction.

2 ALCO'S PILOT OPERATED THERMO® EXPANSION VALVES give a positive control to 15% of nominal capacity with minimum superheat.

3 ALCO SOLENOID PILOT STOP VALVE insures positive liquid "Shut off".

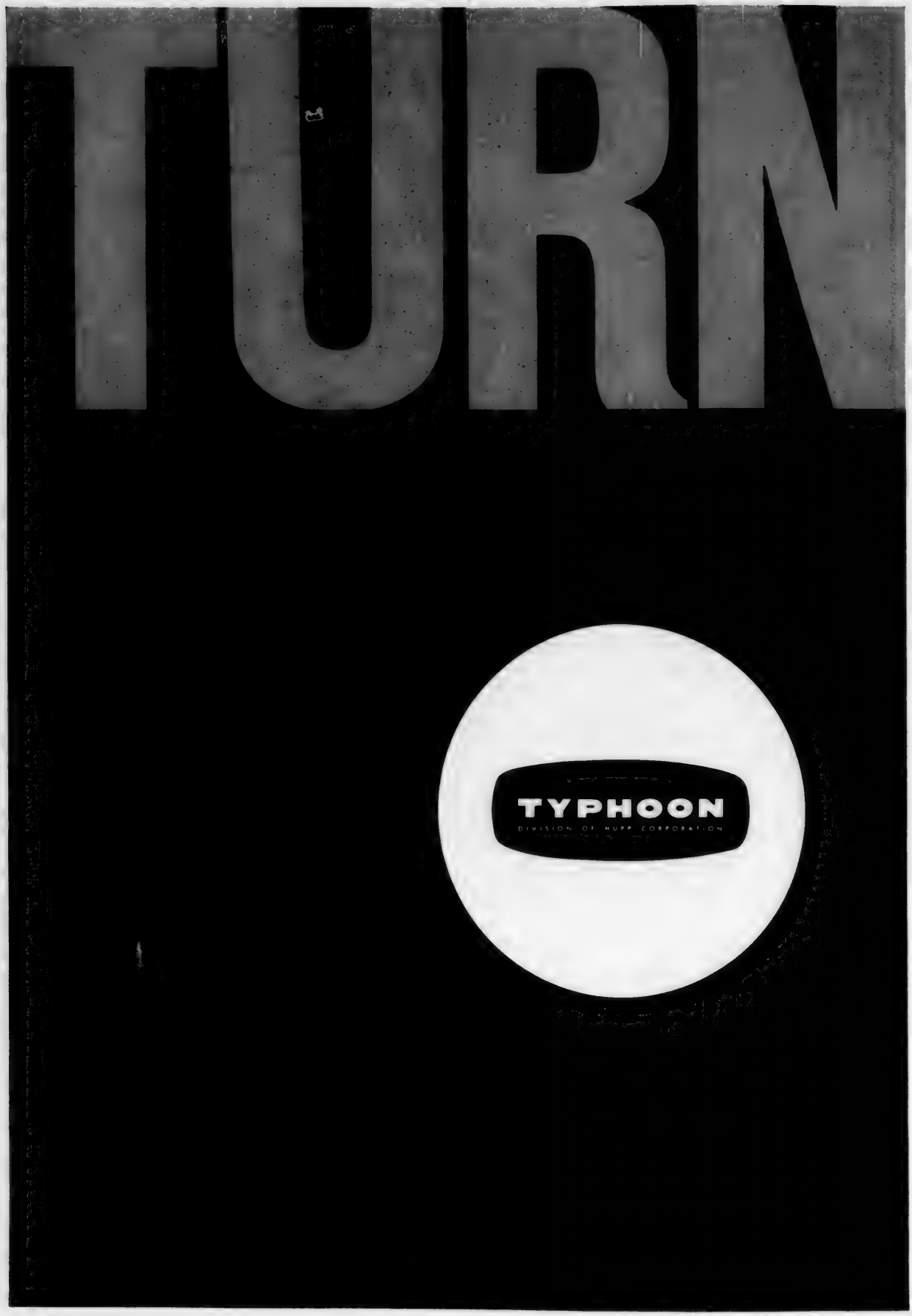


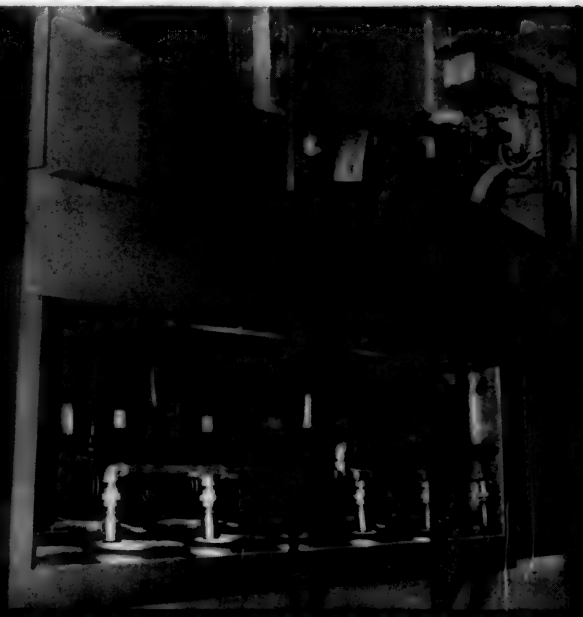

Use and specify ALCO—the one complete line of REFRIGERANT CONTROLS...engineered for efficient trouble free performance.

7988

- *BUY SECURITY*
- *BUY QUALITY*
- *BUY ALCO*

**The one complete line of refrigerant controls: Thermostatic Expansion Valves • Refrigerant Distributors Solenoid Valves • Suction Line Regulators • Flooded Evaporator Controls and Reversing Valves**


TURN
TYPHOON
DIVISION OF HUPP CORPORATION



"Flexibility, versatility, dependability—these are the most important factors to look for where specifying air conditioning equipment, and I find I get all of them and more when I specify and use Typhoon custom-built quality air conditioning units. "One of our most recent Typhoon installations is this 60 ton self-contained packaged unit shown here in the basement of the Green Acres Bowling Lanes in Valley Stream, Long Island. Working together with a separate 10 ton packaged air conditioner, they will provide the ultimate in economy, performance and year round comfort for this beautiful and spacious 48 lane recreation center."

SIDNEY W. BARBANEL
CONSULTING ENGINEER

# AND SPECIFY THE RIGHT EQUIPMENT, FOR EVERY JOB, EVERY TIME!

**Now you can fill every need, solve any problem with Typhoon's exclusive commercial, industrial and residential equipment! Save time for yourself and money for your clients with Typhoon custom-built air conditioning units. You can specify the air discharge and return arrangements you need, and the most practical location for utility service and maintenance access openings. Various combinations of compressors, cooling coils and blowers in the same cabinet provide infinite variations in performance characteristics. This extreme flexibility gives you custom made units at mass production prices. A full range of air cooled units from 2 tons to 20 tons, both packaged and split systems. Water cooled units from 3 tons to 75 tons, air cooled condensing units to 20 tons, water cooled to 75 tons! And the new Typhoon Heat Pumps that open a new era in air conditioning. Each and every unit with built-in Power Reserve—a combination of superior components and oversize parts that insures dependable performance above rated capacity through all weather extremes. All copper condensers in water cooled units, largest coil surfaces and rugged 11 and 14 gauge metal cabinets. Before you plan your next system, find out how Typhoon quality and flexibility can add to your reputation for getting the job done better, faster, more economically!**

TYPHOON
DIVISION OF HUPP CORPORATION

Typhoon Air Conditioning Company, Division of Hupp Corporation
505 Carroll Street, Brooklyn 15, New York

☐ Have a representative call me for an appointment.
☐ Please send full product literature.

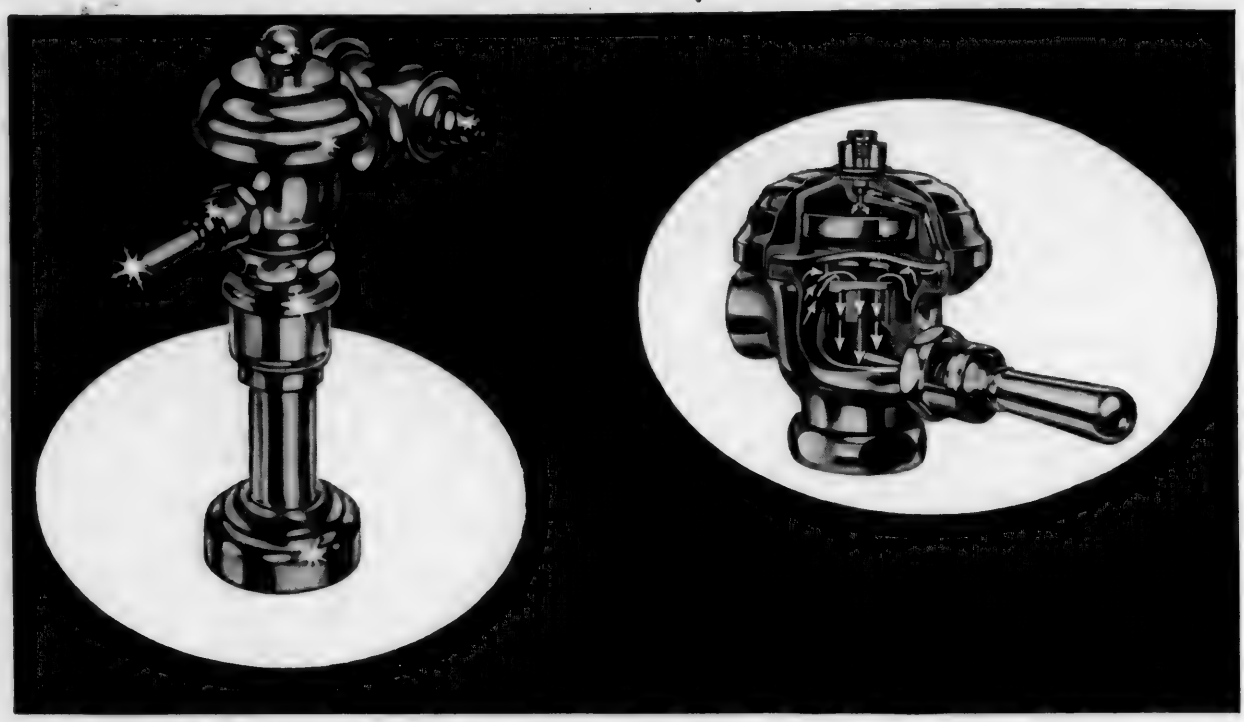
Name_____

Firm_____

Address_____

9A-2

# Watrous FLUSH VALVES / *FIRST with the features that cut maintenance*



## MORE SAVINGS for your clients when you specify WATROUS

Everybody benefits from a better, more dependable installation when you pick Watrous Flush Valves. Watrous design features tell the story. Self-cleansing by-pass (above) for example, purges the by-pass before each flush — quickly rids itself of obstructions that could cause trouble. It's a typical Watrous advantage . . . one reason your clients get more for their money with Watrous.

More advantages are extra-attractive styling . . . wide selection of diaphragm and piston type valves to choose from . . . plus water economy, dependability and easy service features other flush valves cannot equal.

***For complete information on the line that's FIRST in features, FIRST in quality — write for Catalog 449-A or see your Imperial wholesaler.***

SINGLE-STEP SERVICING cuts maintenance time.
SELF-TIGHTENING HANDLE PACKING automatically takes up for wear.
SCREENLESS SILENT-ACTION ends objectionable flushing noises. (Optional).
WATER-SAVER ADJUSTMENT stops water waste — cuts water costs.

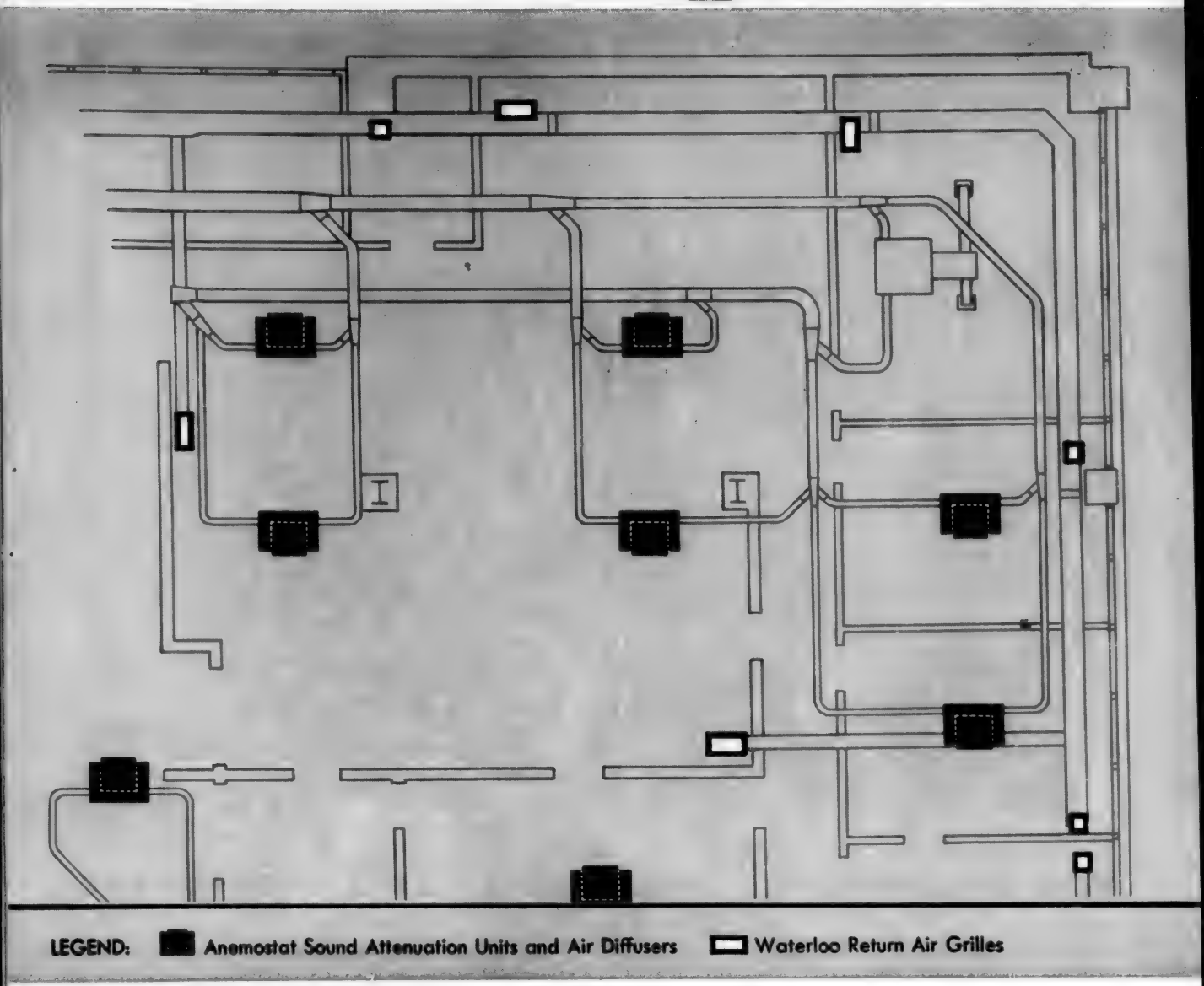
IMPERIAL Watrous

THE IMPERIAL BRASS MFG. CO.
6300 West Howard St., Chicago 48, Ill., Dept. AHV-19

ADJUSTABLE FLUSH VALVES BOTH DIAPHRAGM AND PISTON TYPES

*When you design or specify be sure of top quality with ...*

**ANEMOSTAT®**
**WATERLOO**



LEGEND: Anemostat Sound Attenuation Units and Air Diffusers  Waterloo Return Air Grilles

In this typical layout you can see how Anemostat All-Air High Velocity units and Waterloo Return Air Grilles team up to insure quiet, draftless, perfectly balanced air distribution.

The Anemostat All-Air High Velocity distribution system offers many important advantages. It can be used with smaller than conventional ducts; it can be installed in less time and at less cost. It requires no coils; therefore, there is no leakage, clogging or odor. Anemostat round, square and straightline diffusers with high velocity units are adaptable to a wide variety of architectural designs.

Waterloo's complete line of registers and grilles is the result of 57 years of experience.

Be certain of top quality performance. Put Anemostat-Waterloo equipment to work in your next job.

**ANEMOSTAT®**
**DRAFTLESS *Aspirating* AIR DIFFUSERS**
**ANEMOSTAT CORPORATION OF AMERICA**
10 East 39th Street, New York 16, N. Y.
Representatives in Principal Cities

**WATERLOO**
**REGISTER COMPANY, INC.**
WATERLOO, IOWA
REGISTERS • GRILLES • VOLUME CONTROL DAMPERS • DOOR VENTILATORS

AC-1308

Sound welds are the key to trouble-free installation. Here, 370 ft lengths of 1¼ in. Ammonoduct steel pipe, bent double, are being welded to nipples which are already weld-tight to 8 in. Bethlehem Electric Resistance-Weld steel pipe headers. *General Contractor:* Lawrence Plumbing and Heating, Inc., Baltimore, Md. *Pipe Jobber:* Southern Supply Company, Inc., Baltimore, Md.

# NEW BALTIMORE ICE RINK DOUBLES AS A PARKING LOT

Located on the parking lot of Baltimore's Memorial Stadium, this huge field of pipe will soon be imbedded in concrete to become an 85 x 185-ft ice skating rink. In winter, skaters will waltz on the quick-frozen, hard-surface ice made possible by this top-performing refrigeration pipe, Ammonoduct.

And during the ball seasons, fans of the Orioles and Colts will park their cars *right on the rink!* The 54,000 feet of Ammonoduct steel pipe will help reinforce the concrete so that it will support a rinkful of cars.

Ammonoduct is best known as free-bending pipe for refrigeration service, pipe that can be bent cold without danger of fracture. But it has great strength as well. It's made of special quality open-hearth steel. And it is this steel strength of Ammonoduct pipe that has made the Baltimore rink-parking combination practical.

When you're looking for refrigeration pipe to perform double-duty service, look for steel pipe—ask your jobber for Ammonoduct.

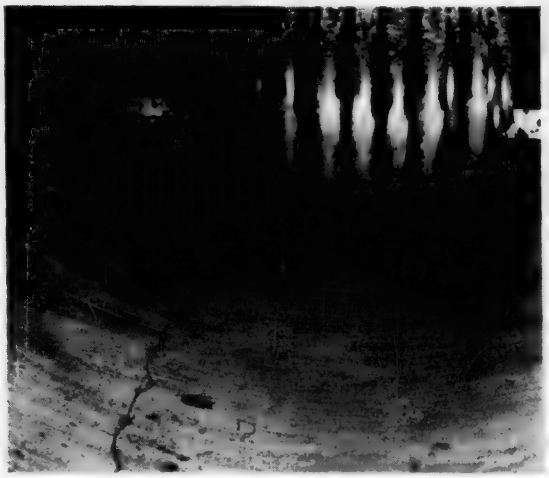
It's top-quality pipe you can rely on.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

**BETHLEHEM STEEL**

BETHLEHEM STEEL

This unretouched photograph shows what can happen to a storage water heater lining of *ordinary* cement under normal service conditions. Cracking and chipping expose the steel plates to rust and corrosion. This cannot happen with properly applied Pre-Krete.



*Of course you can line a steel storage water heater with ordinary cement . . .*

Applied Pre-Krete forms a chemically inert, strong and lasting lining on the interior of open or closed steel vessels. Pre-Krete imparts no flavor or discoloration to water and is completely nontoxic.

*but here are 4 good reasons why P-K's are lined with*

# PRE~KRETE®

*1. Pre-Krete won't crack*

*2. Pre-Krete won't chip*

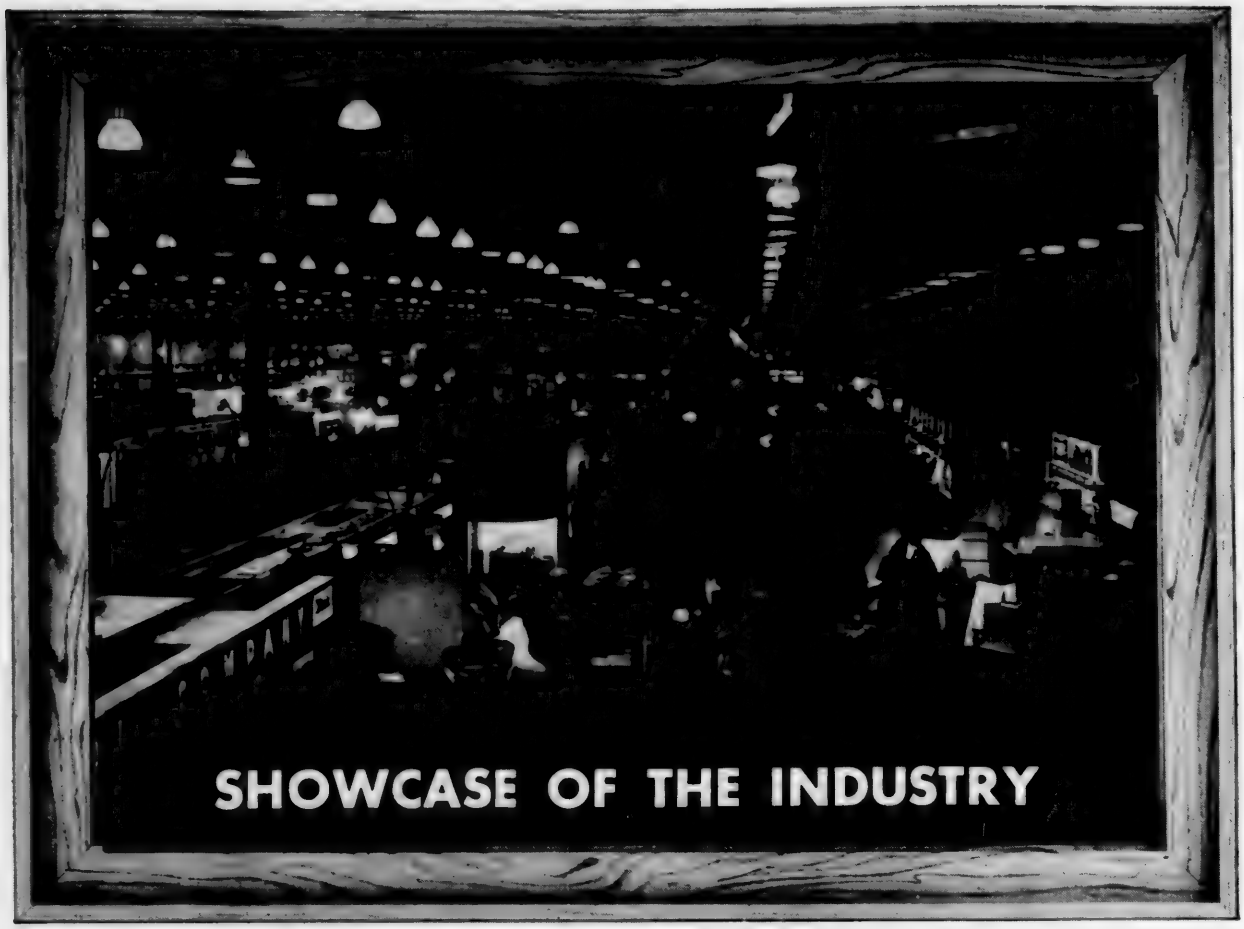
*3. Pre-Krete gives long, durable protection against rust and corrosion*

*4. Pre-Krete withstands water temperatures up to 900° F.*

Storage water heaters built by P-K and factory-lined with PRE-KRETE are fully guaranteed on workmanship and materials. On-the-site lining is also available through P-K's network of franchised applicators, who use Pre-Krete exclusively. Get the whole story of why you gain immediate and lasting benefits by specifying P-K Storage Water Heaters. Ask for Catalog Number 19. Write to Patterson-Kelley, 1101 Linton Street, East Stroudsburg, Pennsylvania.

**Patterson-Kelley** Water Heater Division

storage water heaters • instantaneous heaters • convertors • water to water exchangers




*You'll learn more than ever before at the...*

# 14th INTERNATIONAL HEATING & AIR-CONDITIONING EXPOSITION

*Auspices* **ASHAE**

**Convention Hall  Philadelphia  January 26-29, 1959**

Keeping abreast of the latest developments affecting your business is imperative in today's competitive economic picture.

Here under one roof you'll see and compare the newest products—talk to the representatives of 450 leading manufacturers—spot future trends—and be better prepared to meet tomorrow's problems. It's a concentrated course designed specifically for you.

Make your plans to attend, now. Write the Exposition today for advance registration and hotel information.

**14th INTERNATIONAL HEATING & AIR-CONDITIONING EXPOSITION**

**480 Lexington Avenue, New York 17, N. Y.**

Management: International Exposition Company

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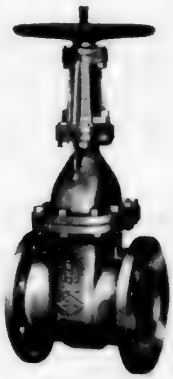

In this **Split Wedge Gate**

you can see why it pays to

# Specify JENKINS for STAINLESS STEEL Valves, too

This picture shows the many points of excellence in the design and construction of Jenkins Fig. 1327 Split Wedge Stainless Steel Gate Valves. Compare them with any valve you know. You'll conclude that it's hard to beat Jenkins at making valves, no matter what the material.

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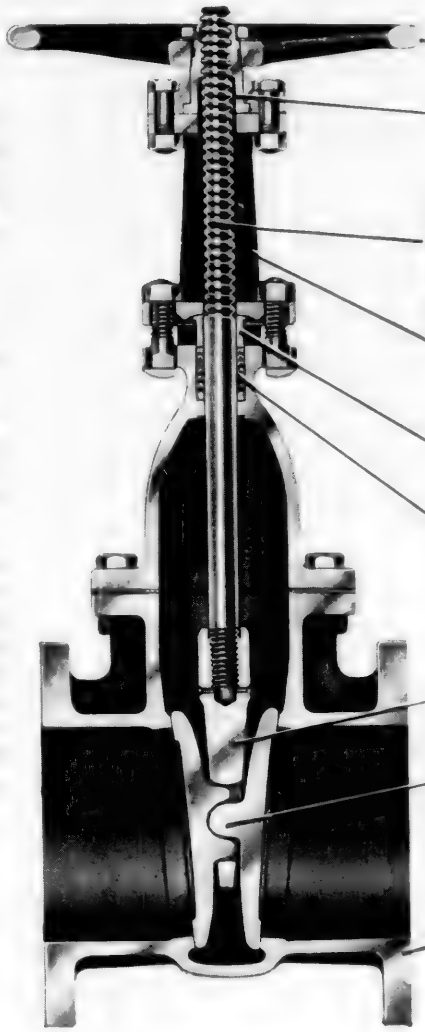

**WHEEL** of high strength malleable iron designed for firm grip and easy operation.

**YOKE BUSHING**, easily renewable. Made of bronze, for ideal thread engagement with stainless steel spindle, to prevent seizing or galling of spindle threads. Bushing of stainless steel is optional.

**SPINDLE** has long thread bearing surfaces with correct lead for easy, tight closing. Screws into wedge carrier, then secured by a stainless steel pin.

**YOKE BONNET** has liberal space between yoke arms for easy access to packing box. Precision machined flange face assures uniform contact with gasket for a tight body-bonnet joint.

**GLAND** consists of two pieces — gland flange and gland follower — eliminates binding of follower in case gland bolts are tightened unevenly.

**PACKING** of Chevron-type Teflon in large packing box prevents leakage. Only a minimum load is required on gland, extending service life of packing.

**WEDGE CARRIER** connects wedge to spindle and raises or lowers it. Husky in size to stand any operating strains.

**SPLIT WEDGE** is the ball-and-socket design which automatically adjusts to the tapered seating surfaces for positive shutoff. The discs, revolving freely in the wedge carrier, produce a self-cleaning action on seating surfaces and reduce possibility of galling and seizing.

**BODY** —Through-port design for full, free flow. Ample wall thickness and good design provide extra strength to withstand stresses. End flanges conform to M.S.S. specs.

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- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

**NASH** ENGINEERING COMPANY
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# LARGE-BUILDING EQUIPMENT SALES TO BE HIGHER IN 1959

**Peter B. B. Andrews**
**Chairman, Future Sales Ratings Board**

FEW of the great segments of the American business structure face so favorable a sales potential as those industries supplying air conditioning, heating, ventilating, piping, plumbing and related equipment for the construction of larger buildings and in the modernization of them in 1959.

The Board of Analysts of Future Sales Ratings, in fact, visualizes 1959 as likely to break all sales records in this field. Favorable sales expectations apply to each of the categories covered in this study, ranging from a 2.7 percent increase for stoker sales to a 12.5 percent increase for air conditioning systems.

Optimism of the Board with respect to air conditioning, heating, ventilating, piping and plumbing products is based on a wide variety of factors to be discussed in more detail later in this study. Primarily, the great buying power visualized by the Board for 1959, both as to the general public and the tremendous cross section of the nation's industries, and the consequent record-breaking boom in construction of larger buildings anticipated ahead, represents the broad base for confidence in the 1959 sales potentials.

The entire foundation of the market for building supplies is seen as rising. This reflects increasing business population as well as sharp gains in the over-all numbers of people. Much is made of the fact that the building equipment industry is one of the nation's outstanding growth lines. This is attributed not only to the expanding base of the construction industry, but also to the fine, new products being produced. The millions of dollars spent by manufacturers in research and product betterment and promotion are paying off, and will continue to do so in the future.

### More Promotion Needed

The only reservation placed by the Board in making an optimistic forecast is that the promotional efforts of the air conditioning, heating, ventilating, piping and plumbing industries must be greater if the manufacturer, distributor and retailer hope to take full anvantage of the 1959 sales potentials in this promising field. Preliminary indications obtained by the Board point defi-

## ESTIMATED POTENTIAL SALES CHANGES 1959 OVER 1958

| | |
|---|---|
| Air Conditioning Systems | +12.5% |
| Blowers, Fans | + 5.8 |
| Boilers | + 5.6 |
| Compressors | + 5.7 |
| Cooling Towers | + 9.0 |
| Electric Motors | + 7.2 |
| Filters | + 6.2 |
| Heating Systems | + 6.7 |
| Pipe and Fittings | + 6.8 |
| Radiators, Convectors | + 6.8 |
| Unit Coolers, Heaters | + 7.4 |

List Continued on Next Page

Economist, market-development counsel and speaker, Peter B. B. Andrews writes with extensive experience on the trends and sales potentials of the nation's many important individual industries. He has contributed industry analyses to no less than 90 of the country's leading trade magazines, as well as sales-projection-engineering studies for some of the country's top industrial enterprises. Called to Washington by former General Motors president William S. Knudsen, who made him industrial economic advisor of the war production board, he received a presidential citation for his effective emergency research work on American industries during World War II. His future sales ratings for Sales Management magazine represent the world's outstanding quarterly series of forecasts (over two decades of forecasting on the 100-plus leading trades of the United States through his 307-man board of analysts of future sales ratings, comprising government and private industry economists, statisticians and marketing experts). Consulting economist of Sales Management magazine and collaborator in Sales Management's famous "Survey of Buying Power," he also has been marketing consultant of the National Production Authority and of the National Distribution Council of the Department of Commerce.

## ESTIMATED POTENTIAL SALES CHANGES IN 1959 OVER 1958

*(Concluded from previous page)*

| | |
|---|---|
| Air Diffusers, Grilles | +9.6% |
| Bearings, Pillow Blocks | +7.8 |
| Belting, Pulleys | +6.9 |
| Burners | +7.0 |
| Coils | +6.3 |
| Condensers | +5.9 |
| Controls | +6.8 |
| Couplings | +6.4 |
| Drying Systems | +9.3 |
| Ducts, Fittings | +6.4 |
| Dust Collectors | +6.0 |
| Furnaces | +6.7 |
| Gages | +6.3 |
| Heat Exchangers | +6.5 |
| Heating Surfaces | +6.1 |
| Hoods, Exhaust | +7.4 |
| Humidifiers | +9.8 |
| Instruments | +8.2 |
| Insulation | +9.9 |
| Pipe Benders | +6.5 |
| Pumps | +6.1 |
| Refrigerants | +8.7 |
| Sheet Metal | +7.4 |
| Spray Nozzles | +6.0 |
| Stokers | +2.7 |
| Strainers | +6.3 |
| Switches | +6.5 |
| Tanks | +6.2 |
| Tools, Hand and Power | +8.0 |
| Traps | +6.7 |
| Tubing | +7.1 |
| Valves | +6.5 |
| Ventilators | +7.8 |
| Vibration Isolation | +8.6 |
| Water Treatment Systems | +7.3 |
| Welding Equipment | +6.9 |

nitely to greater advertising and selling expenditures by these industries for 1959—and with this assurance, as well as the expected stimulating influence of other factors to be brought out in subsequent paragraphs, the Board has assigned to these industries for 1959 the outstanding future sales rating of five stars.

A rating of five stars is the highest an industry can get, (signifying "Best Relative Outlook"), the gradations on lower sales expectations running down to four, three, two and one, the last of which represents the least favorable outlook from the standpoint of potential percentage sales gains over the preceding year. These ratings are the common-denominator determinations of the Future Sales Ratings Board, comprising 309 economists, statisticians and marketing experts, both in Government and in private industry. The Board is the most experienced economic-predicting panel on all the nation's industries in the world, having successfully forecast in *Sales Management* for the past 24 years with a favorable batting average of accuracy by the future-sales potentials of the 114 leading industries of the United States, of which air conditioning, heating, ventilating, piping and plumbing are among the standouts in economic importance.

Commissioned by AIR CONDITIONING, HEATING AND VENTIATING to survey the views of this Board and obtain its specific projections with respect to potential sales increases or decreases in 1959 for 47 air conditioning, heating ventilating, piping and plumbing products and supplies for larger buildings, the writer has obtained the accompanying consensus estimates.

These consensus estimates of potential sales increases over the next 12 months assume average advertising and selling promotion increases by the air conditioning, heating, ventilating, piping and plumbing industries from manufacturer through wholesaler and retailer. However, the Board feels that an even better sales improvement can be made in the anticipated favorable business atmosphere of 1959 if promotional programs are stepped up sufficiently to crystallize fully the forthcoming sales opportunities in this promising field. Conversely, it is believed that lightened promotional programs would result in little or no sales gain over 1958 in many instances.

### Potential Market

Requirements for air conditioning, heating, ventilating, piping, plumbing and related equipment for larger buildings, such as industrial plants, hospitals, hotels, schools, churches, institutions, theaters, government buildings, stores, TV studios, office buildings, etc., will be record-breaking—in the aggregate. This expectation reflects not only the enormous need of modernization of many existing buildings and plants, but also the new highs anticipated over-all in the construction industry over the next 12 months. The huge nature of this market is evident in the Board's estimate of $8,200,000,000 as the potential 1959 total value of the contracts for heating, ventilating, air conditioning, piping and related services in buildings other than homes. Carrying the computation further, if there is deducted from this figure labor, overhead and other non-equipment charges, the value of equipment and materials likely to be bought in the next 12 months is estimated by the Board at a record high of $4,600,000,000.

An Administration drive is on to cut Federal spending in 1959, but even if this campaign succeeds (which is

unlikely in view of Democratic majorities in Congress favoring heavy spending), it would be more than offset by increased State and municipal and private construction in such fields as schools, hospitals, apartments, churches, prisons, libraries, clubs, hotels, motels, camps, stores, TV studios, restaurants, garages, office buildings, warehouses, administrative and service buildings, public utility and highway building, with the result that total new construction in 1959 will attain strong, new highs around $53 billion. That would be a considerable jump over the $49 billion of 1958, and it would compare further with $48 billion in 1957, $28 billion in 1950 and $8 billion in 1939.

### Modernization Up

Basic economic factors are of particularly great significance to the air conditioning, heating, ventilating, piping, plumbing and related industries, since they sell to the cross section of the American economy. Thus, in addition to the benefits to these industries from a tremendous modernization need (with 63 percent of industrial, office and institutional buildings estimated by the Board to be in need of some type of modernization), the basis is strong for rising business from a fast-growing nation, both as to numbers of people and numbers of business concerns.

There are more businesses than ever operating in the United States, and as the business population of the nation grows, so, too, does competition, which in turn places heavy pressure on modernization and new building to keep up with the competition. Maintenance and repair expenditures for all types of construction in 1958 exceeded $18,000,000,000—a record high. They will top $19,000,000,000 in 1959. Manufacturers—either to make profits or survive at all—must be able to produce in a modern, economical fashion; office buildings and large apartment houses must be able to attract desirable tenants—and so the pressure competitively is on the ascendancy throughout the economy.

Financial position of businesses is favorable and improving, just as it is in the case of individual consumers. This means ability to finance expansion, to stimulate a major business uptrend in the economy as confidence returns, to develop new, appealing products, and it indicates the wherewithal to advertise and sell these products adequately, with the consequent further upgrading of rising American living standards.

### Emphasis on Air Conditioning

Air conditioning in particular is one of the categories where living standards have been improved and will be much more so in the future. The Board believes the air conditioning industry has barely tapped the market for industrial and commercial cooling. After a decade of impressive growth, only 30 percent of the nation's commercial and industrial establishments are air conditioned. Practically all new buildings have it, and many older ones are good prospects. Aid conditioning today is a business necessity and not merely a fringe benefit, with studies showing that air conditioning improves worker productivity, resulting in higher sales and earnings. The Board forecasts the 1959 potentials for air conditioning systems as the highest among the larger building equipment categories.

Reflecting the good financial condition of the United States economy, current assets of the nation's corporations exceed $235 billion, including $50 billion in cash and equivalent, while current liabilities total $118 billion, leaving net working capital of $117 billion, a strong, new, all-time high. That figure compares with $113 billion a year ago, $91.8 billion in 1953 and only $24.5 billion in 1939. Encouragingly, too, sales, profits and confidence of businessmen now are riding high. Net income for the fourth quarter of 1958 was far and away the best of the year, and prospects indicate intensification into 1959. This likelihood, plus the fact of strong corporation resources, indicates a forthcoming trend to buy more plant and equipment, build up inventories and—as previously emphasized—increase vital expenditures in advertising and selling. A 10 percent rise in appropriations for promoting and advertising goods is forecast by the Board for the next 12 months.

### Plant Expenditures Rising

The three biggest segments of the business structure which tended to drag it down in the early part of 1958 were: living off inventories, cuts in spending of consumer durable goods (especially autos), and reductions in plant and equipment spending. The first two now are in a distinct uptrend, and spending for new plant and equipment is stabilizing. More than $31 billion for new plant and equipment was spent in 1958—by no means a small amount, even though it was about $6 billion under the record-breaking total of 1957. Still, it was above such spending for any year in history except 1957 and 1956—and for 1959 it is likely to rise.

More than making up this decline in expenditures for new plant and equipment in 1958 is the billion-dollar rise in construction activity over-all, as well as the $4 billion gain in spending of Federal, State and municipal governments and the $5 billion rise in spending of consumers for services, such as medical, dental, personal care, TV and other repair, etc. Then, there is inventory-rebuilding, now going on at a plus annual rate of four billion dollars and the three-billion-dollar increased spending of consumers for foods and in such booming industries as apparel, gasoline and drugs. This $17 billion rise alone (regardless of the uplifting force of many other divisions of the economy now moving up) is enough to raise the gross national product of the country to record levels.

This increased spending for all goods and services of the nation mirrors the dynamic nature of the expanding economy. As the numbers of people grow, so, too, do the needs for schools, hospitals, living quarters, libraries, hotels, motels, camps, stores, entertainment facilities, restaurants, garages, office buildings, warehouses, administrative buildings, service structures, public utility buildings, banks, and the entire gamut of major construction, with consequent benefits to building equipment suppliers, contractors, architects, engineers, and so on.

### Population Increases

Population of the United States now is well over the 175,000,000 mark, a figure which the Census Bureau once thought would not be achieved until the 1970s. That is about 3,000,000 higher than at this time last year, and it is the equivalent of adding another Boston, Cleveland and St. Louis to the great national market of this

country. Another 3,000,000 jump is in the cards for 1959, but very importantly, too, this vigorously expanding population is in a good position to *buy goods* and keep the economy rolling. Population growth alone is not the answer to prosperity—as shown in so many overpopulated areas of the world.

But, in the great industriousness and progressiveness of the United States, population growth means a great deal, for this population is in the best position in history to buy the products of factories that keep the nation humming. Employment is in a strong uptrend, and the spur to income will be all the greater because of the continued uptrend in wages and salaries. Average weekly earnings in manufacturing now exceeds $84. That compares with $83 a year ago, and an average of $82.39 for the year 1957, $71.69 for 1953, and $23.86 for the year 1939. Disposable personal income of the public is record-breaking, and so is the over-all financial reserve position of consumers.

### Research At All-Time High

Finally, the restless, scientific advance of the nation—as typified by the engineering segment of the economy—is sure to bring more progress to stimulate the various facets of American business. Significantly, research expenditures for development of new and better products are running at a new high record 11 percent *above* the previous record established in 1957.

Thus, a big, new potential is being developed for mass appeal to the public and for advancing its living standards further. And, that will result in more plants and machinery, more labor needs, more of the advertising and selling expenditures which in the past have been responsible for stimulating production, consumption and profits in the successful American manner.

Such strong national growth—taking place in a basically dynamic, constantly upgrading economy with high liquid assets and immense buying power—represents significant forward momentum in requirements for air conditioning, heating, ventilating, piping, plumbing and related equipment and services, and, in the Board's judgement, it will permit, for the resourceful in this field, the attainment of new-high revenues in the twelve months of 1959.

---

## Toward a Happier New Year

From two sources comes news that psychological and physiological influences will increasingly become environmental factors promoting a happier and healthier new year for us all, with by-products of greater personal efficiency and worker productivity.

Changing the work environment is such an effective means of boosting worker productivity that industry is investing more than $2-billion in it annually, according to Joseph W. Roberts, vice-president of Muzak Corporation, in a talk at the Fall Personnel Conference of the American Management Association in New York. Mr. Roberts stated that management, in 1957, spent $135-million on lighting, $200-million for sound conditioning, $15-million for background music, $7-million for the coffee in coffee breaks, additional millions on air conditioning and color engineering, and $1.5-billion on furnishings such as wall, window and floor coverings, fabrics, and furniture.

He cited production increases, error and employee turnover reductions due to the psychological effects of one environmental factor—planned background music. He quoted a management engineering study which measured an 8.03% increase in clerical productivity and a 36% decline in lateness after planned background music was introduced.

Investigators at the Westinghouse lamp division are experimenting with ultraviolet lamps that produce quantities of negative air ions. E.G.F. Arnott, director of research for the division, said that the tests have been in progress for about two years and were spurred by evidence that positively and negatively charged ions have a detrimental or favorable effect upon human health and mental outlook.

Dr. Rudolph A. Nagy, Westinghouse manager of ultraviolet development, reports that findings by scientific researchers around the world have indicated that when the air is charged with positive ions, there is a noticeable increase in discomfort, evidenced by fatigue, dizziness, headache, asthma, and sinusitis. An excess of positive ions has also been found to affect rheumatism and arthritis adversely, to cause mental depression, and to retard normal healing processes. On the other hand, it has been seen that comfort is favorably affected when people or animals are subjected to air having an excess of negative ions. Hay fever, asthma, and sinusitis conditions were relieved to some extent, wounds healed more rapidly, and arthritic and rheumatic suffering was lessened.

Dr. Nagy warned that it was far too early to say that generation of negative ions might provide a means for control of illness or mental depression. On the other hand, sufficient evidence does exist to establish beyond reasonable doubt that the ions always present in our atmosphere play an important role in influencing our well-being.

He further reported that it has been known for many years that Sterilamp ultraviolet tubes generate negative ions. For the past 20 years, these lamps have been used in hospitals, schoolrooms, air conditioning systems, and for the protection of poultry and food products. When occasional reports indicated that certain of these lamps relieved asthma, it was assumed that the minute amount of ozone generated by the lamp oxidized the allergens and thus relieved the asthma. It would now appear that relief from asthma resulted from the negative ions produced by the lamp. Negative ion producing lamps are now being tested with a view to incorporating them in home air conditioners and heating systems.

# New Piping Economies for Steam Heating Systems

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**A new method is proposed for sizing piping for a steam heating system which results in pipe of smaller diameter than that obtained by the design procedure followed for many years. Design problems explain the use of tables and data presented and show economies possible through a reduction in pipe sizes.**

PRESENT practice in sizing piping for low pressure steam heating systems differs little from that used half a century ago. The approach has been conservative in the extreme, not necessarily by intent, but by the cumulative effect of several factors of safety. As a result, piping has been, and continues to be, considerably larger than is necessary for most systems.

In the usual case, over-generous pipe sizes do not adversely affect the operation of the system. From the economic standpoint, however, large pipes are of serious consequence in increasing the first cost of the installation. Years ago, costs of material such as pipe, valves, and pipe fittings were a fraction of what they are now. Of greater importance, however, has been the rise in labor costs. The combined increases are of such magnitude that to use piping larger than necessary is an economic waste that cannot be justified or defended.

No attempt will be made here to present an exhaustive analysis of all pipe sizing problems that may be encountered in the various types of steam heating systems. For the sake of simplification and clarity, it is desirable to take one problem as an example to illustrate the factors involved. Because of its general importance and interest, the example selected is the sizing of steam mains for vacuum heating systems. A further qualification is that the mains be installed so that the flow of steam and condensate is in the same direction, for concurrent flow.

### Present Method

As a basis for comparison, it is necessary to state the method now in general use for determining steam main sizes. For a given kind of pipe, the size is dependent upon the maximum load, the density of the steam, the total length of the pipe, and the permitted reduction in steam pressure due to friction. While the outside design temperature condition establishes the maximum load of a heating system, the same maximum load must also be carried during a warmup period after an overnight, or more extended shutdown regardless of the outside temperature. It is usual to state the maximum load either in square feet of equivalent direct radiation, or in pounds of steam per hour. As to the permissible reduction in steam pressure due to friction, or pressure loss, it has been customary to allow ¼ to ½ psi (4 to 8 ounces) for the total length of the main.

The pressure loss is computed by using the Babcock formula for the flow of steam. This formula has been in use for heating system calculations for more than 50 years. It is generally stated as:

$$P = 3.67 \times 10^{-8}\left(1 + \frac{3.6}{D}\right)\frac{W^2L}{dD^5} \qquad \text{(Equation 1)}$$

where P = pressure loss, pounds per square inch
W = steam flow, pounds per hour
L = length of pipe, feet
D = inside diameter of pipe, inches
d = weight of 1 cubic foot of steam, pounds

For some time it has been realized that the Babcock formula is not accurate over much of the range to which it has been applied. There have been many installations of steam piping where the pressure drop computed by the Babcock formula has been at wide variance from the drop actually obtained. Beyond this, there has accumulated a mass of experimental data from various investigators. Much of this data does not conform to values computed by the Babcock formula.

### Modified Formula

Equation (1) is based on the assumption that for a given rate of steam flow $W$, length of pipe $L$, and density $d$, the pressure loss $P$ is solely a function of the internal diameter of the pipe $D$. This assumption was found to be invalid since the discrepancies already mentioned could not be accounted for. It was then determined that the equation should be modified to the following form:

$$P = 3.36 \times 10^{-6}\, f\frac{W^2L}{dD^5} \qquad \text{(Equation 2)}$$

where f = a friction factor.

In Equation (2) the friction factor $f$ is determined by two factors; the relative roughness of the internal surface of the pipe, and the Reynolds Number, a dimensionless qualtity based on the velocity, density, and absolute viscosity of the steam.

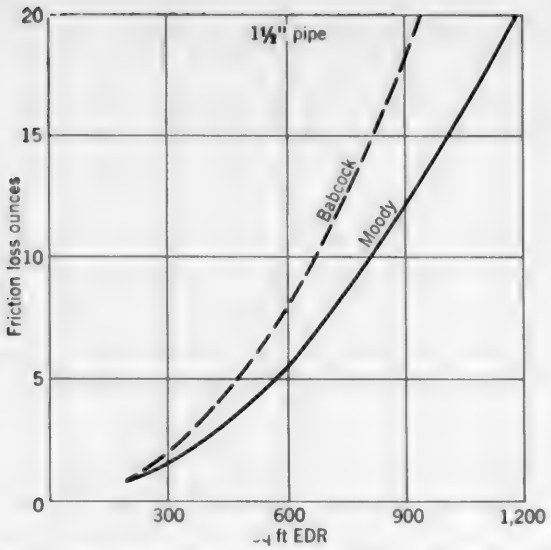



**Fig. 1. Comparative friction losses for 100 ft 1.5-inch, Schedule 40 steel pipe. Steam at 5 psig initial pressure.**

### Friction Factor

A convenient chart for determining factor $f$ was devised and published by Moody in 1944[1]. When so determined, $f$ is designated as the Moody friction factor. In 1951 a comprehensive paper was published by Page and Konzo[2] giving important background information together with charts for sizing steam pipes for various conditions.

For some time the Moody friction factor has been successfully utilized in various engineering fields for computing pressure losses in piping. Unfortunately, however, this has not been the case in sizing steam heating system pipes. To indicate the magnitude of the differences between the two methods, consider Figs. 1 and 2. These charts show the friction loss in ounces per square inch for 100 ft of Schedule 40 steel pipe versus loads in square feet of equivalent direct radiation (EDR). The steam is at an initial pressure of 5 psig, a condition within the range commonly used for heating systems. For the 1½-inch pipe, Fig. 1, the friction loss derived from the Babcock formula is much greater, percentage-wise, than that obtained by using the Moody factor. With 8-inch pipe, Fig. 2, the percentage difference is less. When carried to larger pipes, the differences are further reduced. Finally, with 14-inch and 16-inch pipes, the differences are inconsequential.

There are now strong indications that the Moody friction factor will soon become widely and generally used by engineers in sizing steam piping. This will do much to reduce pipe sizes for all steam mains except those of large diameter.

Beyond the adoption of the Moody friction factor, an even greater aid in reducing pipe sizes is to increase the allowance for pressure loss due to friction. In the example under consideration, the sizing of steam mains for vacuum heating systems pitched for concurrent flow, it has been pointed out that the usual practice is to allow a total friction loss of 4 to 8 ounces per square inch in the steam main. It should be noted that this is for the entire length of the main, not a rate per 100 ft.

There is no valid reason why the steam main friction allowance cannot be increased considerably beyond the usual 4 to 8 ounce range. It is proposed that the allowance be increased to 2.5 psi, or 40 ounces, as a maximum. The increased allowance is well within the limitations of good design, and an efficient proper operating system will be obtained by its use. The 40-ounce allowance does not include losses in branch piping, risers, runouts, and automatic control valves.

At the start of this article, it was said that the use of oversized pipes results from the accumulation of various safety factors. One of these, the use of the Babcock formula, has already been examined. Beyond this, let us now examine other factors of safety in relation to the proposed 40-ounce pressure drop for the steam main.

### Oversize Due to Load

The first factor is that, in common with the whole system, the steam main must be designed to handle a maximum load that is rarely encountered. To illustrate, it is customary to use 0 deg F as the outside design temperature for New York City. In point of fact, this temperature may not be reached at any time during the entire heating season, and in a normal year the temperature seldom drops below 20 deg for more than a few hours at a time. Under average conditions it is evident that the steam main is required to carry only a fraction of the load for which it is designed. All other conditions being equal, the friction loss in the main is substantially proportional to the square of the load; refer to Equations 1 and 2. For example, if the actual load is 50% of the maximum load, then the friction loss is only about 25% of that under the full load condition. In the problem at hand, if the pressure loss is designed to be 40 ounces under full load, it will be reduced to about 10 ounces with a 50% load. Another phase must be noted; regardless of the outside temperature, the steam main will carry the

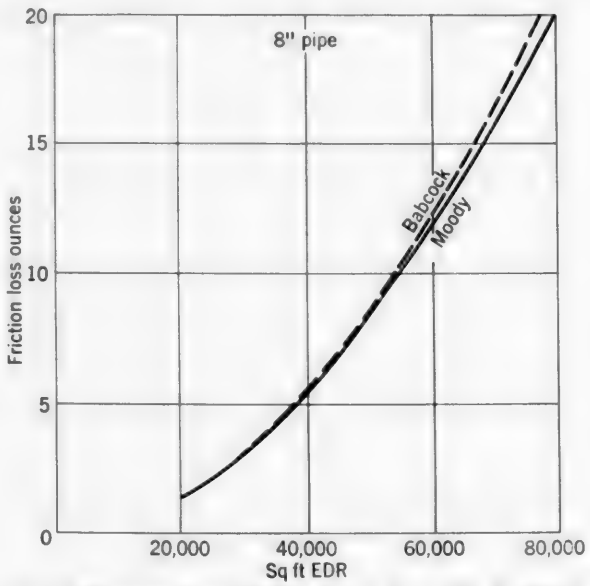



**Fig. 2. Comparative friction losses for 100 ft 8-inch, Schedule 40 steel pipe. Steam at 5 psig initial pressure.**

[1] Moody, L. F., Friction Factors for Pipe Flow, *ASME Transactions*, Vol. 66, p. 671 et seq.
[2] Page, R. H., and Konzo, S., Analysis of Data on Flow of Steam in Pipes, *Heating and Ventilating*, August, 1951, p 85-104.

**TABLE 1—STEAM MAIN CAPACITIES**

For vacuum systems and concurrent flow

| Total Developed Length, Ft | Pipe Diameter, Inches | | | | |
|---|---|---|---|---|---|
| | 1½ | 2 | 2½ | 3 | 3½ |
| | Capacities, Square Feet EDR | | | | |
| 150 | 1380 | 2660 | 4250 | 7500 | 11,200 |
| 200 | 1180 | 2280 | 3700 | 6500 | 9600 |
| 250 | 1050 | 2030 | 3250 | 5750 | 8500 |
| 300 | 950 | 1840 | 2950 | 5200 | 7700 |
| 350 | 870 | 1690 | 2740 | 4800 | 7150 |
| 400 | 810 | 1580 | 2550 | 4500 | 6650 |
| 500 | 720 | 1400 | 2250 | 4000 | 5900 |
| 600 | 650 | 1270 | 2050 | 3600 | 5400 |
| 700 | 600 | 1170 | 1900 | 3350 | 4900 |
| 800 | 560 | 1090 | 1750 | 3100 | 4600 |
| 900 | 525 | 1020 | 1650 | 2900 | 4300 |
| 1000 | 495 | 960 | 1550 | 2750 | 4100 |

full load during a warmup period after a system shutdown. During this period the maximum pressure drop will also occur, but the condition is of short duration.

Next of importance is the fact that there are a limited number of pipe sizes available and therefore the desired friction drop must be approximated. This approximation always tends toward oversizing the pipe. In practice, it works out that where a load falls between the capacities of two sizes of pipe, the larger pipe is selected.

Tables 1 and 2 have been devised for use in selecting pipe sizes by the proposed method. They also serve to illustrate the ever present tendency toward oversizing. The tables are in a form often used for selecting steam main sizes. In this case, they are based on the Moody friction factor in Equation (2), steam at 5 psi gage initial pressure, Schedule 40 steel pipe, and a total friction loss of 2½ psi, or 40 ounces. The pipe capacities are in square feet EDR which can be converted to pounds per hour by dividing by 4, if desired. Total developed length of the mains includes losses for pipe and pipe fittings.

To show the oversizing effect, take as an example, a main having a total developed length of 350 feet. Table 1 shows that a 2½-inch pipe will carry a load of 2740 sq ft EDR, whereas a 3-inch pipe will carry 4800 sq ft EDR, an increase of 75% in capacity. Assume further, that the actual load is halfway between (an average situation), or 3770 sq ft EDR. In this case, the 3-inch pipe will be selected, but the actual load will be 79% of the capacity of the pipe, and the friction drop, varying approximately with the square of the load, will be only 62% of the desired value.

Analysis of the capacities of the various standard pipe sizes between 1-inch and 16-inch indicates that, on the average, only some 80% of the full pipe capacities can be utilized. Thus with an average load of 80%, the friction will be reduced to approximately 80% × 80% = 64% of the friction drop at full loading. To put it another way, if the objective for steam mains is a friction loss of 40 ounces, the loss in the average case will be only about 26 ounces due to the limited number of pipe sizes available.

If the above two "oversizing" factors are combined, as would be the case under average conditions, the result is highly significant. To demonstrate this, assume: First, that due to mild outside temperature conditions the average steam requirement is 50% of full load; and second, that due to the limitations imposed by standard pipe sizes, only 80% of the permitted friction loss will be taken up at full load. The load will then be 50% × 80% = 40% of the pipe capacity. If the permitted drop is 40 ounces, the friction loss is reduced from 40 ounces to 40 × 40% × 40% = 6.4 ounces, since the friction varies approximately as the square of the load.

### Other Factors

With a vacuum heating system, there is another factor that offsets a temporary increase in friction in the main during the peak load that occurs in the warmup period. When the system starts after an overnight shutdown, the vacuum heating pump should quickly establish a vacuum in the return lines and even beyond. The vacuum will extend beyond the return lines because the thermostatic traps on the heating surfaces will be open, and will remain open, until the radiation is filled with steam. The vacuum thus created in the heating surfaces will materially aid the flow of steam in the main.

Finally, there is a factor that applies to systems equipped with automatic steam control valves. Such systems use an automatically controlled valve for each heating surface. It should be noted that while the greatest friction loss in the piping occurs during the maximum load condition, the greatest pressure loss through the valves is during the minimum load condition, when the valves are throttling the flow of steam. Thus, pressure losses resulting from the two causes tend to offset each other.

When the above factors are given full consideration, it becomes clear that the proposed increase in the friction allowance for steam mains is reasonable, and far less than might be at first supposed.

To indicate typical pipe size reductions for steam mains, consider the two examples that follow. In each case the pipe sizes have been determined first by the method now in common use, then by the new method. The loads are in square feet EDR. The "total developed length" of the mains for both examples includes losses for pipe and pipe fittings.

### Example 1

*Pipe sizes by present method.* Since the developed length is only 200 ft, the total permitted pressure drop should not exceed 4 ounces, or in this case, 2 ounces per 100 ft. The average steam pressure is assumed to be

**TABLE 2—STEAM MAIN CAPACITIES**

For vacuum systems and concurrent flow

| Total Developed Length, Ft | Pipe Diameter, Inches | | | | |
|---|---|---|---|---|---|
| | 4 | 5 | 6 | 8 | 10 |
| | Capacities, Square Feet EDR | | | | |
| 150 | 15,300 | 28,000 | 45,500 | | |
| 200 | 13,300 | 24,000 | 39,000 | 79,000 | |
| 250 | 11,800 | 21,500 | 35,000 | 70,000 | 129,000 |
| 300 | 10,700 | 19,500 | 31,500 | 64,000 | 118,000 |
| 350 | 9,900 | 18,000 | 29,000 | 59,500 | 108,000 |
| 400 | 9,200 | 16,800 | 27,000 | 55,000 | 100,000 |
| 500 | 8,200 | 15,000 | 24,200 | 49,000 | 90,000 |
| 600 | 7,500 | 13,600 | 22,000 | 45,000 | 82,000 |
| 700 | 6,800 | 12,500 | 20,500 | 41,500 | 76,000 |
| 800 | 6,400 | 11,700 | 19,000 | 38,500 | 70,000 |
| 900 | 6,000 | 11,000 | 17,800 | 36,500 | 66,500 |
| 1,000 | 5,650 | 10,300 | 17,000 | 34,500 | 63,000 |

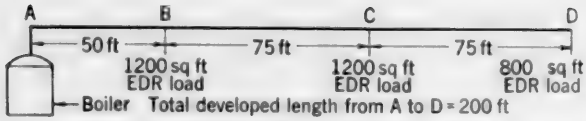



**Fig. 3. Details of layout for Example 1.**

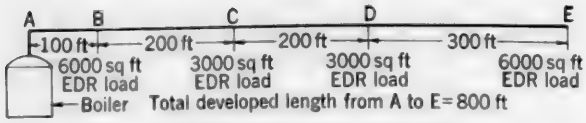



**Fig. 4. Details of layout for Example 2.**

**TABLE 3—COMPARISON OF LOAD VALUES FOR EXAMPLE 1**

| Section | Pipe Dia, Inches | Load—Sq Ft EDR | | % of Pipe Capacity Used |
|---|---|---|---|---|
| | | Required Load | Permitted Load, Table 1 | |
| A to B | 2½ | 3200 | 3700 | 86 |
| B to C | 2 | 2000 | 2280 | 88 |
| C to D | 1½ | 800 | 1180 | 68 |

1 psig. The pipe sizes for the three sections of the main will be:

| Section | Load Sq Ft EDR | Pipe Dia., Inches |
|---|---|---|
| A to B | 3200 | 4 |
| B to C | 2000 | 3½ |
| C to D | 800 | 2½ |

*Pipe sizes by new method.* The total pressure drop should not exceed 40 ounces, or in this case, 20 ounces per 100 ft. Since the new method allows for a greater friction loss, the steam is assumed to be at 5 psig initial pressure, rather than 1 psig average pressure. There is, in any case, little difference in the friction loss for the two pressure conditions. The pipe sizes for the three sections of the main, as selected from Table 1, for a total developed length of 200 ft are as follows:

| Section | Load Sq Ft EDR | Pipe Dia., Inches |
|---|---|---|
| A to B | 3200 | 2½ |
| B to C | 2000 | 2 |
| C to D | 800 | 1½ |

**Example 2**

*Pipe sizes by present method.* In this example, the developed length is 800 ft. Since this is greater than 200 ft, the permitted pressure drop is increased to a maximum of 8 ounces, which is equivalent in this case to 1 ounce per 100 ft. The average steam pressure is again assumed to be 1 psig. The pipe sizes for the four sections of the main will be:

| Section | Load Sq Ft EDR | Pipe Dia., Inches |
|---|---|---|
| A to B | 18000 | 10 |
| B to C | 12000 | 8 |
| C to D | 9000 | 8 |
| D to E | 6000 | 6 |

**TABLE 4—COMPARISON OF LOAD VALUES FOR EXAMPLE 2**

| Section | Pipe Dia, Inches | Load—Sq Ft EDR | | % of Pipe Capacity Used |
|---|---|---|---|---|
| | | Required Load | Permitted Load Table 2 | |
| A to B | 6 | 18000 | 19000 | 95 |
| B to C | 6 | 12000 | 19000 | 63 |
| C to D | 5 | 9000 | 11700 | 77 |
| D to E | 4 | 6000 | 6400 | 94 |

*Pipe sizes by new method.* The total pressure drop should not exceed 40 ounces, or in this case, 5 ounces per 100 feet. The initial steam pressure is again assumed to be 5 psig. The pipe sizes for the sections of the main, as selected from Table 2, for a total development length of 800 feet are as follows:

| Section | Load Sq Ft EDR | Pipe Dia., Inches |
|---|---|---|
| A to B | 18000 | 6 |
| B to C | 12000 | 6 |
| C to D | 9000 | 5 |
| D to E | 6000 | 4 |

The two examples above confirm that, although the aim under the new method is for a 40-ounce friction loss, the actual loss will be much less. Note the comparison in Tables 3 and 4. These comparisons are based on Examples 1 and 2.

The computed friction loss for the lengths of pipe shown for each section of Example 1 under the actual full load condition totals 26.7 ounces, rather than 40 ounces. If it be assumed that the average load will be 50% of full load, then the friction loss will be reduced to $26.7 \times 0.5 \times 0.5 = 6.7$ ounces, rather than 40 ounces.

The total computed friction loss for full load is 28 ounces. For 50% of full load, the friction loss will be 7 ounces, rather an 40 ounces.

The remainder of the steam piping required for a vacuum heating system, as well as the piping required for other types of steam systems, is subject to some of the same considerations that have been discussed here. In each case there are opportunities for important first cost savings by not using oversized pipes. To take advantage of these cost saving possibilities will be of real benefit to the many designers and users of steam who recognize the numerous advantages of steam as a heating medium.

## Refrigeration Safety Code Revised

Sponsored by The American Society of Refrigerating Engineers, the American Standard Safety Code for Mechanical Refrigeration has been revised to keep abreast of technical developments in the field of refrigeration. It covers the safe design, construction, installation, operation and inspection of every refrigeration system employing a fluid which is vaporized and normally liquefied in its refrigerating cycle. The code does not apply to the use of water or air as a refrigerant nor to refrigeration systems installed on railroad cars.

## APPARATUS DEW POINTS FOR COMFORT COOLING

| DB | WB | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 58 | SHF | 1.00 | 0.96 | 0.92 | 0.88 | 0.85 | 0.82 | 0.80 | 0.78 | 0.76 | 0.75 | 0.74 | 0.73 | 0.72 |
| | | ADP | 49.6 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 |
| | 59 | SHF | 1.00 | 0.95 | 0.90 | 0.86 | 0.83 | 0.80 | 0.77 | 0.75 | 0.74 | 0.73 | 0.72 | 0.71 | .... |
| | | ADP | 51.7 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | .... |
| | 60 | SHF | 1.00 | 0.95 | 0.89 | 0.84 | 0.80 | 0.77 | 0.75 | 0.73 | 0.71 | 0.69 | .... | .... | .... |
| | | ADP | 53.6 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | .... | .... | .... |
| 71 | 58 | SHF | 1.00 | 0.96 | 0.92 | 0.88 | 0.85 | 0.83 | 0.81 | 0.79 | 0.78 | 0.77 | 0.76 | 0.75 | 0.74 |
| | | ADP | 48.8 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 | 37 |
| | 59 | SHF | 1.00 | 0.95 | 0.90 | 0.86 | 0.83 | 0.81 | 0.79 | 0.77 | 0.75 | 0.74 | 0.73 | 0.72 | 0.71 |
| | | ADP | 50.9 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 |
| | 60 | SHF | 1.00 | 0.93 | 0.88 | 0.84 | 0.81 | 0.78 | 0.76 | 0.74 | 0.72 | .... | .... | .... | .... |
| | | ADP | 52.9 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | .... | .... | .... | .... |
| 72 | 59 | SHF | 1.00 | 0.94 | 0.90 | 0.87 | 0.84 | 0.82 | 0.80 | 0.78 | 0.76 | 0.75 | 0.74 | 0.73 | 0.72 |
| | | ADP | 50.1 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | 39 | 38 |
| | 60 | SHF | 1.00 | 0.93 | 0.88 | 0.85 | 0.82 | 0.79 | 0.77 | 0.75 | 0.74 | 0.73 | 0.72 | .... | .... |
| | | ADP | 52.2 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | .... | .... |
| | 61 | SHF | 1.00 | 0.92 | 0.87 | 0.83 | 0.79 | 0.77 | 0.75 | 0.73 | 0.71 | .... | .... | .... | .... |
| | | ADP | 54.2 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | .... | .... | .... | .... |
| 73 | 60 | SHF | 1.00 | 0.93 | 0.88 | 0.85 | 0.82 | 0.80 | 0.78 | 0.76 | 0.75 | 0.74 | 0.73 | 0.72 | .... |
| | | ADP | 51.4 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 | .... |
| | 61 | SHF | 1.00 | 0.96 | 0.91 | 0.87 | 0.83 | 0.80 | 0.78 | 0.76 | 0.74 | 0.72 | 0.71 | .... | .... |
| | | ADP | 53.5 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | .... | .... |
| | 62 | SHF | 1.00 | 0.96 | 0.90 | 0.85 | 0.81 | 0.77 | 0.75 | 0.73 | 0.71 | .... | .... | .... | .... |
| | | ADP | 55.4 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | .... | .... | .... | .... |
| 74 | 61 | SHF | 1.00 | 0.96 | 0.91 | 0.87 | 0.84 | 0.81 | 0.79 | 0.77 | 0.75 | 0.74 | 0.73 | 0.72 | .... |
| | | ADP | 52.8 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | .... |
| | 62 | SHF | 1.00 | 0.95 | 0.89 | 0.85 | 0.81 | 0.78 | 0.76 | 0.74 | 0.73 | 0.72 | .... | .... | .... |
| | | ADP | 54.7 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | .... | .... | .... |
| | 63 | SHF | 1.00 | 0.95 | 0.88 | 0.84 | 0.80 | 0.76 | 0.74 | 0.72 | 0.70 | .... | .... | .... | .... |
| | | ADP | 56.1 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | .... | .... | .... | .... |
| 75 | 62 | SHF | 1.00 | 0.93 | 0.89 | 0.85 | 0.82 | 0.79 | 0.77 | 0.75 | 0.74 | 0.73 | 0.72 | .... | .... |
| | | ADP | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | 44 | .... | .... |
| | 63 | SHF | 1.00 | 0.97 | 0.90 | 0.85 | 0.81 | 0.78 | 0.75 | 0.73 | 0.72 | .... | .... | .... | .... |
| | | ADP | 56.3 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | .... | .... | .... | .... |
| | 64 | SHF | 1.00 | 0.93 | 0.87 | 0.82 | 0.78 | 0.75 | 0.72 | 0.70 | .... | .... | .... | .... | .... |
| | | ADP | 57.9 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | .... | .... | .... | .... | .... |
| 76 | 63 | SHF | 1.00 | 0.98 | 0.91 | 0.87 | 0.83 | 0.80 | 0.78 | 0.76 | 0.74 | 0.72 | .... | .... | .... |
| | | ADP | 55.3 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | .... | .... | .... |
| | 64 | SHF | 1.00 | 0.91 | 0.86 | 0.82 | 0.78 | 0.75 | 0.73 | 0.71 | .... | .... | .... | .... | .... |
| | | ADP | 57.2 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | .... | .... | .... | .... | .... |
| | 65 | SHF | 1.00 | 0.91 | 0.85 | 0.80 | 0.76 | 0.73 | 0.71 | .... | .... | .... | .... | .... | .... |
| | | ADP | 59.1 | 58 | 57 | 56 | 55 | 54 | 53 | .... | .... | .... | .... | .... | .... |
| 77 | 63 | SHF | 1.00 | 0.96 | 0.91 | 0.87 | 0.84 | 0.81 | 0.78 | 0.76 | 0.74 | 0.73 | 0.72 | .... | .... |
| | | ADP | 54.7 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | 46 | 45 | .... | .... |
| | 64 | SHF | 1.00 | 0.96 | 0.90 | 0.85 | 0.82 | 0.79 | 0.76 | 0.74 | 0.72 | .... | .... | .... | .... |
| | | ADP | 56.6 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | .... | .... | .... | .... |
| | 65 | SHF | 1.00 | 0.96 | 0.89 | 0.84 | 0.80 | 0.77 | 0.74 | 0.72 | .... | .... | .... | .... | .... |
| | | ADP | 58.5 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | .... | .... | .... | .... | .... |
| 78 | 64 | SHF | 1.00 | 0.94 | 0.89 | 0.85 | 0.82 | 0.79 | 0.77 | 0.75 | 0.73 | 0.72 | .... | .... | .... |
| | | ADP | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | .... | .... | .... |
| | 65 | SHF | 1.00 | 0.94 | 0.88 | 0.84 | 0.80 | 0.77 | 0.75 | 0.73 | 0.71 | .... | .... | .... | .... |
| | | ADP | 57.9 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | .... | .... | .... | .... |
| | 66 | SHF | 1.00 | 0.94 | 0.87 | 0.82 | 0.78 | 0.75 | 0.72 | 0.70 | .... | .... | .... | .... | .... |
| | | ADP | 59.7 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | .... | .... | .... | .... | .... |

## APPARATUS DEW POINTS FOR COMFORT COOLING (CONTINUED)

| DB | WB | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 65 | SHF | 1.00 | 0.92 | 0.87 | 0.83 | 0.79 | 0.77 | 0.75 | 0.73 | 0.72 | .... | .... | .... | .... |
| | | ADP | 57.2 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | .... | .... | .... | .... |
| 79 | 66 | SHF | 1.00 | 0.92 | 0.86 | 0.82 | 0.78 | 0.75 | 0.73 | 0.71 | .... | .... | .... | .... | .... |
| | | ADP | 59.1 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | .... | .... | .... | .... | .... |
| | 67 | SHF | 1.00 | 0.92 | 0.84 | 0.80 | 0.77 | 0.74 | 0.71 | .... | .... | .... | .... | .... | .... |
| | | ADP | 60.9 | 60 | 59 | 58 | 57 | 56 | 55 | .... | .... | .... | .... | .... | .... |
| | 65 | SHF | 1.00 | 0.96 | 0.91 | 0.87 | 0.84 | 0.81 | 0.78 | 0.76 | 0.74 | 0.73 | 0.72 | .... | .... |
| | | ADP | 56.6 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 47 | .... | .... |
| 80 | 66 | SHF | 1.00 | 0.96 | 0.90 | 0.86 | 0.82 | 0.79 | 0.76 | 0.74 | 0.72 | 0.71 | .... | .... | .... |
| | | ADP | 58.5 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | 50 | .... | .... | .... |
| | 67 | SHF | 1.00 | 0.97 | 0.90 | 0.84 | 0.80 | 0.77 | 0.74 | 0.72 | 0.70 | .... | .... | .... | .... |
| | | ADP | 60.3 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | .... | .... | .... | .... |
| | 67 | SHF | 1.00 | 0.92 | 0.87 | 0.83 | 0.80 | 0.77 | 0.75 | 0.73 | 0.71 | .... | .... | .... | .... |
| | | ADP | 59.1 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | .... | .... | .... | .... |
| 82 | 68 | SHF | 1.00 | 0.90 | 0.86 | 0.82 | 0.79 | 0.76 | 0.73 | 0.71 | .... | .... | .... | .... | .... |
| | | ADP | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | .... | .... | .... | .... | .... |
| | 69 | SHF | 1.00 | 0.92 | 0.86 | 0.81 | 0.77 | 0.73 | 0.71 | .... | .... | .... | .... | .... | .... |
| | | ADP | 62.8 | 62 | 61 | 60 | 59 | 58 | 57 | .... | .... | .... | .... | .... | .... |
| | 69 | SHF | 1.00 | 0.95 | 0.88 | 0.84 | 0.80 | 0.77 | 0.74 | 0.72 | 0.70 | .... | .... | .... | .... |
| | | ADP | 61.7 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | .... | .... | .... | .... |
| 84 | 70 | SHF | 1.00 | 0.96 | 0.89 | 0.83 | 0.79 | 0.75 | 0.72 | 0.70 | .... | .... | .... | .... | .... |
| | | ADP | 63.5 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | .... | .... | .... | .... | .... |
| | 71 | SHF | 1.00 | 0.98 | 0.89 | 0.83 | 0.78 | 0.74 | 0.71 | .... | .... | .... | .... | .... | .... |
| | | ADP | 65.2 | 65 | 64 | 63 | 62 | 61 | 60 | .... | .... | .... | .... | .... | .... |
| | 70 | SHF | 1.00 | 0.91 | 0.85 | 0.81 | 0.78 | 0.75 | 0.73 | 0.71 | 0.70 | .... | .... | .... | .... |
| | | ADP | 62.4 | 61 | 60 | 59 | 58 | 57 | 56 | 55 | 54 | .... | .... | .... | .... |
| 86 | 71 | SHF | 1.00 | 0.91 | 0.85 | 0.79 | 0.76 | 0.73 | 0.70 | .... | .... | .... | .... | .... | .... |
| | | ADP | 64.2 | 63 | 62 | 61 | 60 | 59 | 58 | .... | .... | .... | .... | .... | .... |
| | 72 | SHF | 1.00 | 0.92 | 0.84 | 0.80 | 0.76 | 0.72 | 0.69 | .... | .... | .... | .... | .... | .... |
| | | ADP | 65.9 | 65 | 64 | 63 | 62 | 61 | 60 | .... | .... | .... | .... | .... | .... |
| | 72 | SHF | 1.00 | 0.93 | 0.87 | 0.82 | 0.78 | 0.75 | 0.72 | 0.70 | .... | .... | .... | .... | .... |
| | | ADP | 64.9 | 64 | 63 | 62 | 61 | 60 | 59 | 58 | .... | .... | .... | .... | .... |
| 88 | 73 | SHF | 1.00 | 0.94 | 0.87 | 0.81 | 0.77 | 0.73 | 0.70 | .... | .... | .... | .... | .... | .... |
| | | ADP | 66.6 | 66 | 65 | 64 | 63 | 62 | 61 | .... | .... | .... | .... | .... | .... |
| | 74 | SHF | 1.00 | 0.91 | 0.88 | 0.81 | 0.76 | 0.72 | 0.69 | .... | .... | .... | .... | .... | .... |
| | | ADP | 68.3 | 68 | 67 | 66 | 65 | 64 | 63 | .... | .... | .... | .... | .... | .... |

The above table gives apparatus dew points for various sensible heat factors for the room design conditions noted. It is submitted by H. A. Dodge, consulting engineer, New York, N. Y., as an appendix to his article "Convenient Selection of Package Units" that appeared on page 59 of this magazine in the September, 1958, issue. Room dry bulb temperatures are those given in Table 1 of that article. Those three wet bulb temperatures most likely to come within the scope of a comfort cooling installation are included. Thus, these data will suffice for most cases.

Sensible heat factor (SHF) is defined as the ratio of room sensible heat loss to total (sensible plus latent) heat loss. For conditions not covered in the table, the following formula can be used:

$$SHF = 0.244(DB - ADP) \div [0.244(DB - ADP) + (1076/7000)(w_1 - w_2)]$$

where

DB = room dry bulb temperature, deg F,
ADP = apparatus dew point temperature.
$w_1$ = moisture content of room air, grains per pound of dry air, at design dry bulb (DB) and wet bulb (WB),
$w_2$ = moisture content of air at ADP, grains per pound of dry air.

Values of $w_1$ may be obtained from Table 1, cited before, and values of $w_2$ are found in any table of thermodynamic properties of moist air. However, ADP can be solved for only by a cut and try method, using the formula given, hence the value of this table for rapid solution.

Glenn L. Martin torture chamber subjects jet planes to simulated flight stresses.

## Both radiant slab and unit heaters are needed in

# Heating an Aircraft Torture Chamber

ERNEST F. SIEGEL
Chief Mechanical-Electrical Engineer
Green Associates, Inc., Baltimore, Md.

AN INTERESTING problem presented itself when our firm was commissioned to design a structural test building for the Glenn L. Martin Company. This 3.1 million dollar building is now in use to subject aircraft frames as well as complete jet planes to simulated flight stresses. The planes under test are literally torn apart to establish stresses at failure and to determine causes for these failures.

### Structure

The building is approximately 216 ft square and 89 ft high. The design criteria set forth that a clear unobstructed span of 205 ft by 205 ft should be maintained and that the clear height had to be a minimum of 60 ft. Main trusses of the building start at an elevation of 60 ft above the floor slab and are 20 ft deep. The concrete slab is 210 ft square and approximately 5 ft 6 inches deep. The building is equipped with rolling doors on either side. One of these doors is 180 ft wide by 60 ft high.

### Design Criteria

The design criteria for the heating installation were unusually strict because variations in temperature and intermittent movement of air masses would affect the calibration of the sensitive gages and instruments used for the testing. The following criteria were established:

1. Uniform temperature to be maintained over an area 205 ft by 205 ft in plan and 30 ft in height. Indoor design temperatures were 68 deg F in the working areas and 70 deg in the office areas for an outdoor temperature of 0 deg. (The building is being maintained at 66 deg in the working areas since experience has shown that this is a more comfortable condition.) The design was based on 4,800 degree-days per year.

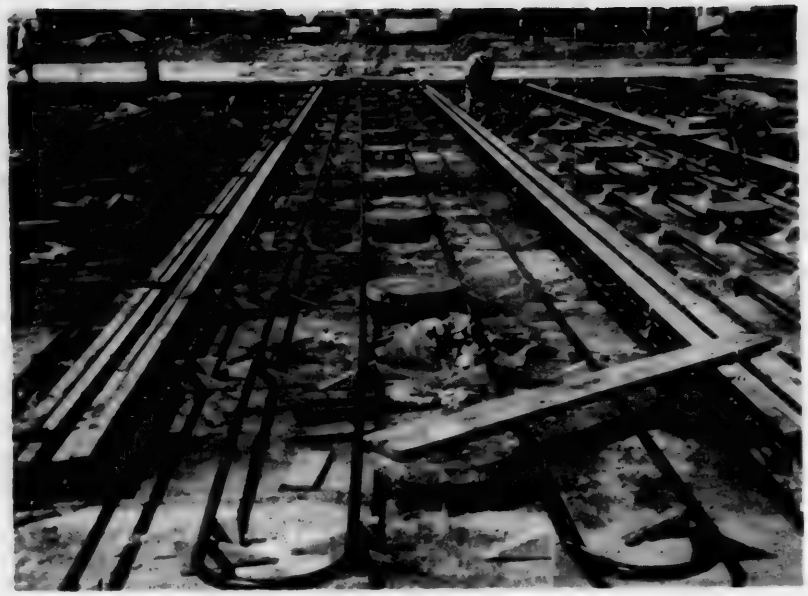
2. No noticeable movement of warm air between the slab and the bottom of the trusses.

3. Heating equipment and piping to be isolated from the considerable vibrations and movements which result from testing.

4. No floor space was available for heating equipment on the main slab.

### Where to Put the Pipes?

These criteria immediately suggested a radiant heating installation since unit heaters or similar air handling units would have produced considerable air circulation and since a peripheral system of radiation would not supply sufficient heat in the center of the building. However, a radiant heating installation presented considerable difficulties. The source of heating could not be installed in the "ceiling" since there was to be no ceiling, and the space between the slab and the trusses was unavailable



Arrangement of wrought iron radiant heating piping in the slab before final topping and wear surface was poured.

since it was to be used for tiedown cables during testing.

Installation of radiant heating in the slab, however, was restricted by anchor plates and tiedown rails which form a checkered pattern over the entire floor area on 5-ft centers. Each of the 420 anchor plates consist of eight 2 inch diameter alloy steel rods embedded 6 ft deep in the concrete slab and attached to a 23 inch diameter steel plate. Tiedown rails were installed on 10-ft centers and consisted of a railing channel and bolting cages approximately 14 inches wide and 50 inches deep running the entire width of the structure. Thus, the radiant heating installation had to be squeezed into spaces, approximately 4 ft 6 inches wide, between each set of rails and anchor plates. It soon became evident that the number of pipes which could be installed between the rails and tiedown bolts would not provide sufficient heat transfer to offset all the heat losses in the structure. In addition, the variations in the heating load, which could be expected in this building, resulting, for example, from the opening of the large doors, could not be readily compensated for by a radiant heating system which had a "built-in" time lag.

### Split System Adopted

A split system, consisting of a radiant heating installation to supply 3.5 million Btu's on a design day and a system of unit heaters installed around the periphery of the building to supply 3.2 million Btu was adopted. By having carefully controlled air distribution from the unit heaters, the outside walls are wiped and the large doors are blanketed, without producing noticeable airflow in the working area of the building.

The radiant heating system consists of 40 individual coils, each with 3 loops on 18-inch centers and each 100 ft long. Each loop is connected to a supply and reverse return header, run in special trenches paralleling the slab on each side. In order to increase the heat output of the radiant heating system, the coils were installed directly under and in contact with the reinforcing steel in the top of the slab. Thus, the reinforcing steel helps to distribute the heat over the entire area. This design not only increases the heat transfer but also provides for better distribution and faster warm-up. Wrought iron pipe is used and coils are installed approximately 4 inches below the finished slab. In order to reduce the downward losses, the 5-ft, 6-inch slab was poured in two layers. The top wearing surface in 8 inches deep and the main slab is approximately 4 ft 10 inches deep. The two layers are separated by an asphaltic paint.

Provision had to be made for melting ice and snow in the tracks of the large doors. The radiant heating system was extended to satisfy this requirement. An antifreeze solution is circulated through the system to prevent freeze-up.

Peripheral unit heaters are fed from a low pressure steam system in the conventional manner. The entire installation is supplied from two 125-hp, oil-fired boilers which are automatically controlled. Steam-to-ethylene glycol heat exchangers serve the radiant system.

### Results are Gratifying

The structural test building has been in operation since early 1957 and the severe winter of 1957-58 has been the first heating season. The results have been most gratifying. The temperature throughout the building is maintained uniformly and sudden load increases, resulting from opening of the large doors, is compensated for immediately. The uniformity in temperature throughout the working space simplifies the calibration of test equipment. While comfort conditions are maintained at working level, the temperature in the upper portion of the building can and is being maintained at lower levels for reasons of economy. The controls on the peripheral unit heaters are adjusted so that these units are only used when the outdoor temperature falls near design levels. During mild days when the outdoor temperature ranges between 35 and 60 deg, only the radiant portion of the heating system is in operation.

Thus, while the planes and fuselage sections are subjected to all forms of torture in this building, the personnel operate the instruments of torture under most comfortable heating conditions.

# Economical Solar Heating Nears

**Moderate temperature heating, with maximum temperatures around 200 deg F, seems to be the first practical use of solar energy. While it holds forth many possibilities in the commercial and industrial field — air drying, for instance — its successful application to residential heating is very near, thanks to research done at Massachusetts Institute of Technology, the Association for Applied Solar Energy, in Phoenix, Ariz. and, described below, work at the University of Arizona, in Tucson. The heating engineer is reminded that application of "free" sun energy requires some unconventional thinking, as contrasted to that involved in use of conventional fuels. Because operating costs are so low, the importance of (amortized) first costs is heightened. An economical balance between collector size and heat pump capacity is sought. Also, contrary to popular belief, solar heating may be most economical in those areas having the longest heating seasons, because of the greater use factor for the equipment and greater annual savings in fuel. The significance of the solar house experiment is better appreciated when it is realized that space heating is the largest single consumer of fuel.**

PRACTICAL, low-cost harnessing of solar energy for residential heating and cooling is nearing reality. The solar research "house" described in the June, 1957 issue of this magazine is being completed at the University of Arizona's Institute of Atmospheric Physics.

Presently undergoing initial tests in Tucson, Ariz., the 1,440-square-foot, one-story, ranch-type structure has been designed to provide a comprehensive facility for technical study of applied solar energy, and for research into problems of solar and atmospheric radiation measurements. According to Raymond W. Bliss, Jr., associate physicist at the Institute and director of the solar house project, solar heating systems will become both economical and practical throughout much of the United States within the next five to ten years. The notable exceptions are the Pacific Northwest and the Great Lakes areas, where there are frequent cloudy days.

The heating and cooling system of the research house uses a 1,600-sq ft copper solar collector with integral parallel tubes to carry water, the circulating heat exchange medium. The material is .025 inch thick, with ½- to 5/16-inch ID parallel tubes on 5-inch centers. In winter, the roof functions during sunny daylight periods as a conventional solar heat collector. During hot weather, the roof operates at night as a heat rejector. In addition, the copper surface also serves as conventional roofing.

Necessary thermal storage is provided by an insulated 4400-gal water tank. Energy distribution to and from the building interior, both in winter and summer, is accomplished by circulating water from the storage tank through copper ceiling panels with integral tubes of the same type and approximate dimensions as the roof collector. An auxiliary heat pump is included in the system for use during prolonged periods of cloudy, extra-warm, or extra-cold weather. It operates to change the temperature levels of the water in the storage tank.

### Winter Operating Procedure

In winter, the collector adds heat to the bottom of the storage tank during sunny days. Heated water is pumped from the top of the tank through the interior ceiling panels. During long cloudy spells, the heat pump adds heat to the top of the tank, increasing its temperature to a level usable by the interior panels, and decreasing the temperature in the lower part of the tank. The decreased temperature in the lower part, from which the collector circulates, actually increases collector efficiency.

The auxiliary heat pump has a higher coefficient of performance than conventional heat pumps which obtain their energy from outdoor air. The unit takes energy from the bottom of the storage tank, which is always at a higher temperature than outside air. Additionally,

Experimental solar-heated structure.

Insulated 4400-gal tank stores thermal energy.

since the interior ceiling panels operate at temperatures lower than are required for conventional radiation, heat pump efficiency is further improved. The evidence, according to Mr. Bliss, points to a reduction in heat pump electric power requirements by one-third to one-half.

### Summer Operating Procedure

In summer, the flow scheme is similar to that of winter, except that the relative positions on the tank of collector and interior panel connections are reversed. The roof collector is operated nightly to reject heat from the top of the tank by radiation and convection, and the panels draw cooled water from the bottom of the tank. During particularly hot weather, when the collector is unable to reject sufficient heat, the heat pump operates to raise the temperature at the top of the tank (thereby improving the heat rejection efficiency of the collector), and simultaneously to lower the temperature at the bottom of the tank (thereby providing water of proper temperature for the interior panels). The system is sized so that the heat pump will operate only occasionally during the winter, but fairly regularly in summer.

Under design outdoor air temperature conditions (30 deg F) the Arizona scientists believe that a panel water temperature of about 100 deg will be required to heat the building. Average Tucson outdoor air temperatures are higher, so it is estimated that the winter ceiling panel water temperature will range between 85 and 95 deg.

During the summer, a ceiling panel water temperature of 60 deg is believed necessary to handle the afternoon peak design load. Peak design load is based on an assumed clear day with maximum outdoor air temperature of 107 deg, and will occur during the dry part of the summer (June and early July). Lower building cooling loads are expected during the summer rainy season (mid-July through August). Calculations indicate that during this summer rainy season the building cooling load can nearly always be handled with panel water temperatures as high as 68 deg. This is approximately the peak dew point to be expected during the summer rainy season, and hence represents the minimum allowable panel temperature during the season if condensation upon panels is to be avoided. Interior design dry bulb temperature for the building is 75 deg, summer and winter.

Present design does not include any means of changing the moisture content of the incoming ventilation air. Relative humidities as high as 85% will be common in the building during the summer rainy season. Mr. Bliss and his associates believe that this situation will have no adverse effect on interior comfort conditions providing that interior design dry-bulb temperature of not greater than 75 deg is maintained.

### Auxiliary Heat Pump System

The heat pump system consists of a Brunner Model 16 H & C compressor with 5.73 cfm displacement, using F-12 refrigerant. A specially designed Sporlan thermostatic expansion valve is used. Rated refrigeration capacity of the compressor is about 22,000 Btu per hr at 110 deg refrigerant condensing temperature and 50 deg refrigerant evaporating temperature, which the scientists believe will be fairly typical peak summer operating conditions. Condenser and evaporator are installed within the storage tank, and heat transfer to the water is by natural convection.

Copper panel collector roof with integral tubes.

Winter heating capacity of the heat pump is quite variable, depending upon condenser and evaporator temperatures. It is expected that a fairly typical heat rejection rate at the condenser will be around 26,000 Btu per hr.

The control system of the heating-cooling system operates to start the heat pump whenever the water temperature at the top of the storage tank is too low to satisfy the building heating demand. This condition could occur because of exceptionally cold weather, but it is more likely to take place as the result of cloudy weather. Provided the weather is sunny, the solar heat collector can normally handle the building heating load without recourse to the heat pump. However, if the sun is overcast for two or more consecutive days, heat pump operation will probably be required for the next two or three days following this cloudy spell.

### Construction Features

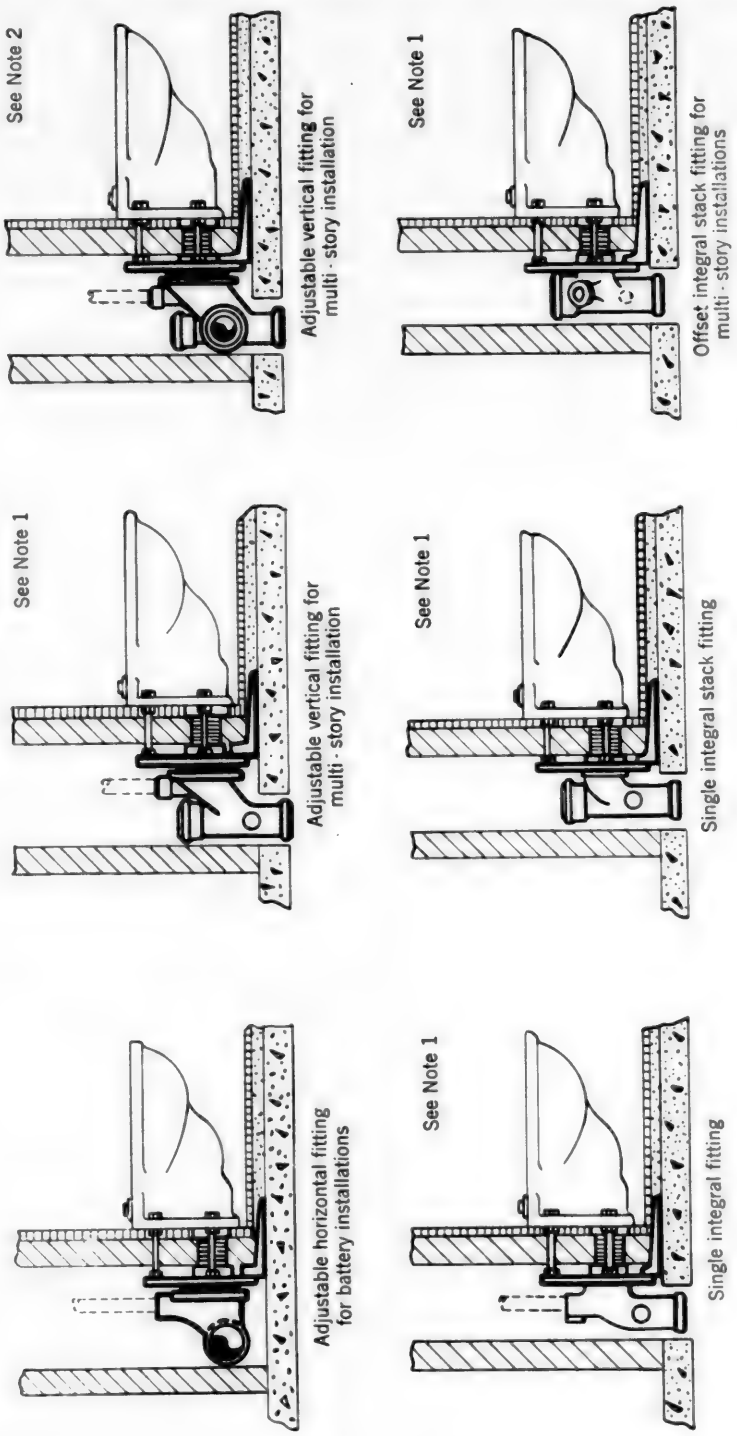
Of interest to architects, builders, and air conditioning engineers are the use of well-insulated masonry cavity walls, to provide maximum thermal storage and maximum smoothing of peak heating or cooling loads; copper ceiling panels with integral tubes which handle the entire heating and cooling functions, and also serve as the decorative ceiling; and site orientation and design of the building for maximum efficiency of the cooling system, yet with 50 foot candles or more of natural interior illumination. The roof overhang, sunshades, and window locations prevent any direct sunshine from entering the building between March 21st and September 21st, minimizing the air conditioning load. The building has 450 sq ft of Thermopane glass, donated to the project by Libbey-Owens-Ford.

### Commercial Systems Forecast

"Three factors will very probably result in the development of commercially sound solar heating and cooling systems within the next five years," Mr. Bliss said. "These are: (1) The progress and improvements in solar heating expected to result from research programs such as this one; (2) probable manufacturing improvements and cost reductions in components of solar heat collection systems; and (3) the constantly rising relative costs of conventional fuels.

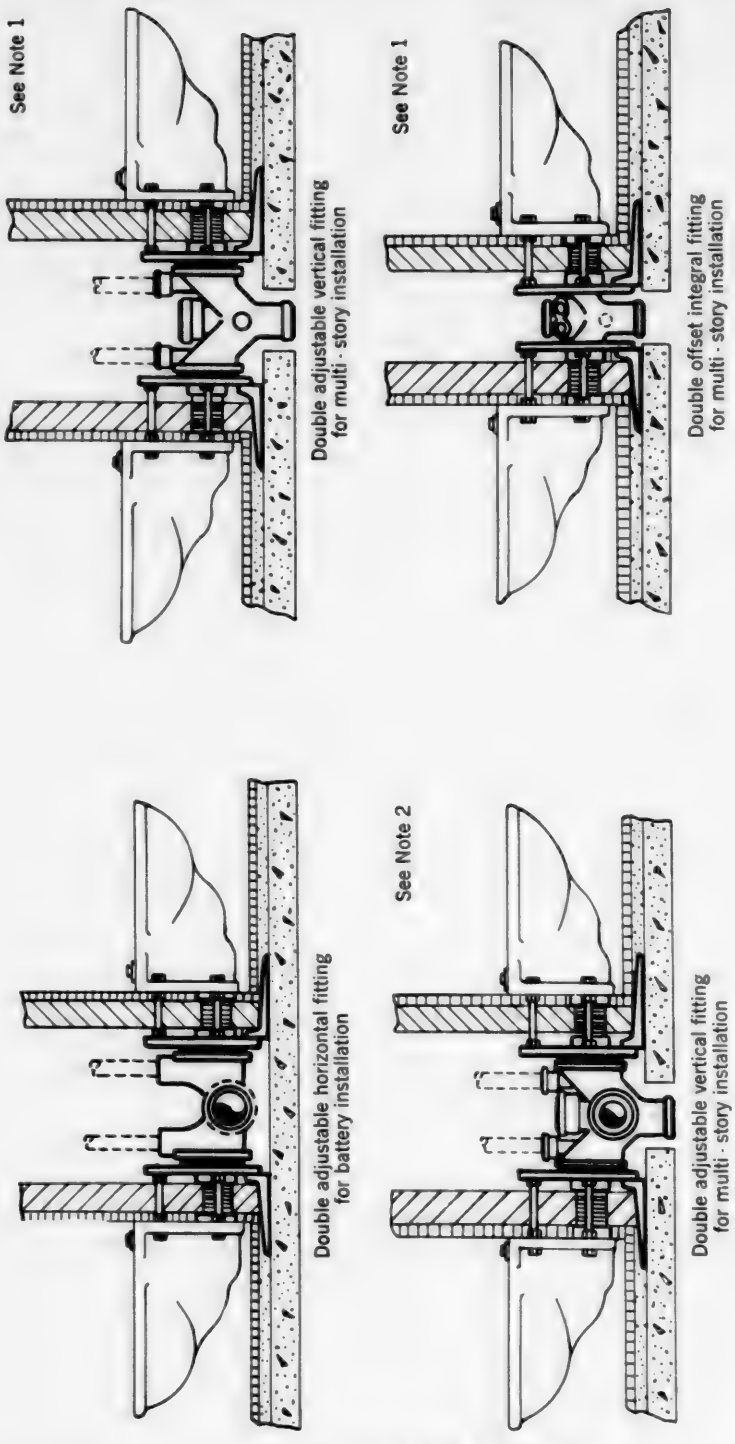
"Fuel and electricity costs for a standard refrigeration system and gas heating for this same house would cost slightly over $400 per year. Operating costs of the solar research 'house' are expected to be $200 maximum—about half the cost of the conventional systems, perhaps even less."

# APPLICATIONS OF CARRIER FITTINGS


See Note 2
Adjustable vertical fitting for multi-story installation
See Note 1
Offset integral stack fitting for multi-story installations
See Note 1
Adjustable vertical fitting for multi-story installation
See Note 1
Single integral stack fitting
See Note 1
Adjustable horizontal fitting for battery installations
See Note 1
Single integral fitting

Notes:
(1) Unit can be equipped with inlets to receive lavatory waste piping.
(2) Unit can be equipped with inlets to receive piping from branch water closets or urinals.

# APPLICATIONS OF CARRIER FITTINGS


See Note 1
Double adjustable vertical fitting for multi-story installation
See Note 1
Double offset integral fitting for multi-story installation
Double adjustable horizontal fitting for battery installation
See Note 2
Double adjustable vertical fitting for multi-story installation

Notes:
(1) Unit can be equipped with inlets to receive lavatory waste piping.
(2) Unit can be equipped with inlets to receive piping from branch water closets or urinals.

Drawings on This and Reverse Side
Courtesy of Jay R. Smith Mfg. Co., Union, N. J.

# Gas Powered Air Conditioning

**Prepared by the Following Members of the Air Conditioning and Heating Committee of the American Gas Association**

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ROBERT M. WILSON, Manager, Large Tonnage Division, Arkla Air Conditioning Corp., Little Rock, Ark.

**Air conditioning equipment, powered by gas, has been in successful operation in commercial and industrial buildings. The various refrigeration and dehumidification cycles are described with data on characteristics, application and economic considerations. For the guidance of engineers, specifications are given for the various systems that are covered in this comprehensive article.**

HIGHLY successful gas air conditioning equipment of various types has been installed in countless homes, and industrial and commercial buildings. The gas industry members are in agreement that they have proven equipment and have plenty of gas available to get the summer cooling business to the same extent as they have developed their winter heating load.

As to the need for air conditioning and its trend, a survey was made by the Trane Company. Based on this data, predictions were made that by 1960, 40% of the new factories and 10% of the old factories in the city of Atlanta, Ga., will be air conditioned; in Dallas, Tex., 74% of the new and 50% of the old; in Houston, Tex., 70% of both new and old, and in New York City, 50% of both the new and old. These proportions will increase until in 1980 just about every factory in these cities will have air conditioning.

A recent survey by E. I. du Pont de Nemours reveals that there are today almost 3,500,000 industrial and commercial establishments without air conditioning. This market is virtually untapped. There are more firms who have never been called on or never have been solicited for the purpose of selling them air conditioning than the group that has been solicited.

## Types of Cycles

Air conditioning equipment using natural gas as the primary source of energy, can be divided into two categories, depending on how the heat energy is applied. In the first category, gas is used *directly* in the equipment and the energy released by the burning gas operates the unit; examples are direct-fired absorption and gas engine driven units. In the second, or *indirect* application, gas is used in boilers to generate steam or hot water, which in turn operate the air conditioning equipment.

Gas-operated air conditioning refrigeration units are currently available in capacity ranges from 3 to 3,000 tons. Multiple unit installations will meet specifications where a single unit of the tonnage required is unavailable. Absorption type units can be obtained in sizes from 3 to over 700 tons; gas engine driven units, from 3 to 76 tons; steam turbine driven compressor units, from 100 to 3,000 tons.

## Absorption Refrigeration Cycle

For the sake of simplification, the cycle is shown in Figure 1-*D* as operating with four separate chambers. In actual practice, the condenser and generator are combined into a high pressure shell, with the absorber and evaporator located in a second shell. Figure 2 schematically shows this arrangement. A purge unit is included to remove any non-condensables from the ma-

## TABLE I—GENERAL SPECIFICATIONS OF CURRENT GAS-POWERED AIR CONDITIONERS

| Manufacturers' Rating, Tons | Manufacturer* | Minimum Temperature, Deg F | Steam Requirements | | Gas Consumption Btu per Ton-Hr | Cooling Tower Water | |
|---|---|---|---|---|---|---|---|
| | | | Pressure Psig[1] | Consumption Lb per Ton-Hr | | Gpm per Ton | Heat Rejection Btu per Ton |
| **Lithium Bromide Absorption** | | | | | | | |
| 3½; 5 | Arkla | 40 | — | — | 23,000 | 3.6 | 34,800 |
| 25; 100 | Arkla | 40 | 3 | 20 | 27,000[2] | 2.9 | 32,000 |
| 60-705 | Carrier | 40 | 12 | 20 | 27,000[2] | 3.1-3.8 | 32,000 |
| 106-740 | York | 40 | 12 | 20 | 27,000[2] | 3.6 | 32,000 |
| **Ammonia Absorption** | | | | | | | |
| 50-5000 | York | —70 | 5[4] | 21.4[3] | 28,500[2, 3] | 4.0[3] | 33,400[3] |
| **Natural Gas Engine Driven Compressors** | | | | | | | |
| 15-150 | Ready-Power | 0 | — | — | 13,000 | 3.0 | 19,000 |
| 3-10 | Weatherbuster | 35 | — | — | 18,000 to 25,000 | — | 30,000 to 37,000 |
| **Steam Turbine-Driven Centrifugal Compressors** | | | | | | | |
| 100-3000 | Carrier | —100 | 5 to 500; Average, 125 | 12 to 40; Average, 16 | Varies; Average, 21,000 | 3.0 | 24,000 to 52,000 Average 28,000 |
| 100-3000 | Worthington | —100 | | | | | |
| 100-3000 | York | —100 | | | | | |
| 200-1600 | Trane | + 32 | | | | | |

[1] Nominal rating. For lower operating pressures, consult manufacturer.
[2] Gas consumption based on 75% boiler efficiency.
[3] Approximate data at air conditioning temperature level.
* Full company names are Arkla Air Conditioning Corp.; Carrier Corp.; York Corp.; The Ready Power Company; The Weatherbuster Corp.; Worthington Corp.; The Trane Company. For company addresses, see reference at end of article.

chine, thus assuring maximum efficiency and capacity at all times.

### Vapor Compression Refrigeration Cycle

In this cycle, Fig. 3, a mechanical compressor is used to pump the refrigerant vapor from the evaporator to the condenser. Vapor from the evaporator, where it has been evaporated in performing the cooling task, is compressed and delivered to the condenser where it is liquefied. Its latent heat of vaporization is absorbed by the condenser cooling medium, which is usually water or air at normal temperatures.

The liquefied refrigerant collects in the bottom of the condenser or in a separate receiver and from there is fed back to the evaporator through suitable control valves, and the cycle is repeated.

A comparison of the vapor compression and the absorption cycles shows that they have in common the vaporizing and condensing of a refrigerant, but differ in that one has a compressor unit and the other an absorber-

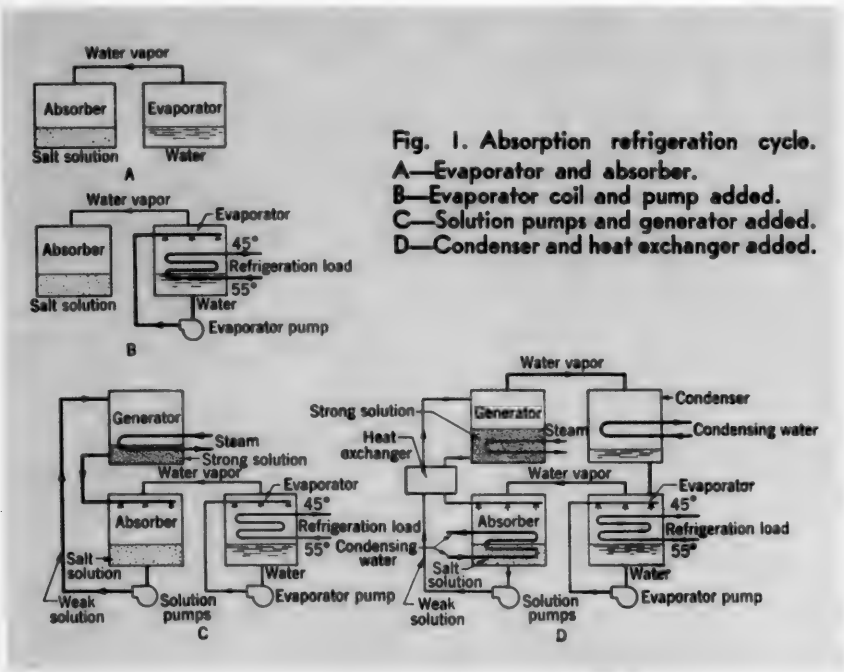


**Fig. 1. Absorption refrigeration cycle.**
**A—Evaporator and absorber.**
**B—Evaporator coil and pump added.**
**C—Solution pumps and generator added.**
**D—Condenser and heat exchanger added.**

generator unit for producing the necessary pressure difference between vaporizing and condensing levels. Both cycles require energy for operation: Mechanical energy for the vapor compression cycle; heat energy for generation in the absorption cycle.

### Dehumidification Cycle

The open absorption and open adsorption cycles are closely related and are known as dehumidification cycles. They differ from all other refrigeration cycles because they bring the air to be conditioned into direct contact with the sorbent. Two types of systems are shown in Figs. 4 and 5.

In the open *adsorption* process, the sorbent does not change, either physically or chemically. Some materials used in this process are activated alumina, activated bauxites, and silica gel.

In the *absorption* action, the material changes physically, chemically or both. Some materials used in this process are solid calcium chloride, and solutions of lithium chloride, calcium chloride, lithium bromide, and the ethylene glycols.

In both the absorption and adsorption cycles, the sorbent is continuously reactivated for re-use in the cycle. This reactivation is most often done by heat supplied by natural gas.

### Types of Units

The foregoing three cycles are applied by manufacturers in their gas powered air conditioning units. Six types are currently available:

1. Direct-fired absorption units

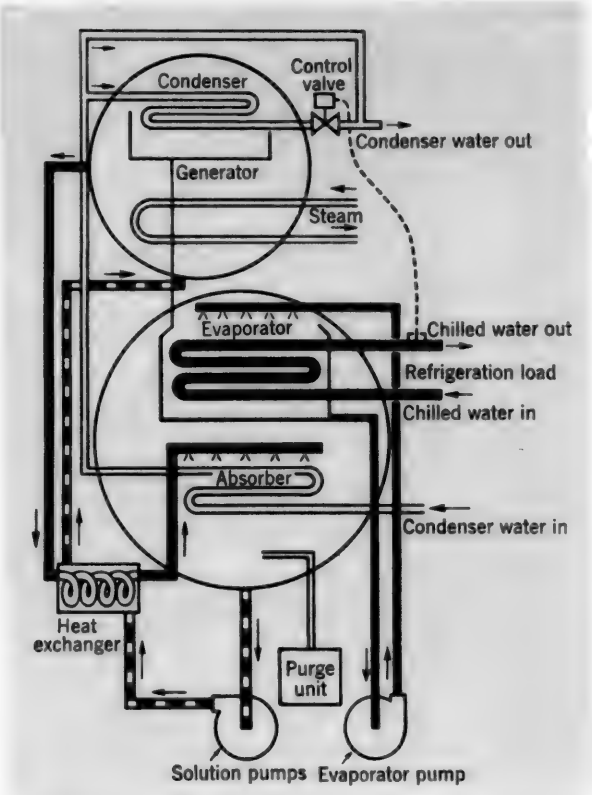


Fig. 2. Schematic arrangement of absorption units.

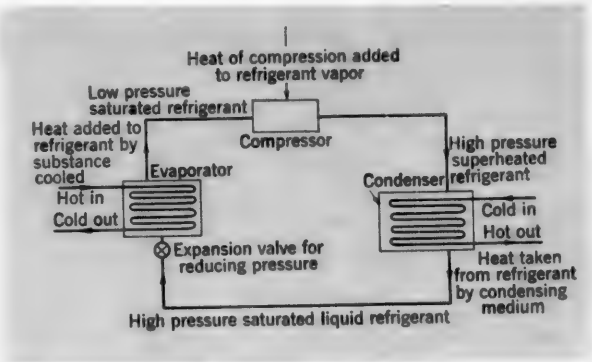


Fig. 3. Vapor compression cycle.

2. Steam-operated absorption units
3. High-temperature water or hot liquid operated absorption units
4. Gas engine-driven vapor compression units
5. Steam turbine-driven centrifugal compressor units
6. Dehumidification units

### Characteristics and Application

In general, the first five of the six gas air-conditioning units listed are applied to air conditioning systems with standard application engineering methods. The major variations in engineering approach, as compared with electrically-operated equipment, are details involving service connections and foundation requirements. Dehumidification units are usually used in combination with other refrigeration equipment.

The term "coefficient of performance" (COP) is used to indicate the efficiency of air-conditioning equipment. It is defined as the ratio of refrigerating effect to heat input.

For the purpose of quick comparison, Table 1 lists the principal features of the various types of natural gas powered equipment.

### Direct-Fired Absorption Units

Arkla[1] manufactures direct-fired water-cooled package units for year-round use. These can be used for either heating or cooling and are suitable for residential and small commercial applications. They are used with matching evaporative water coolers designed especially for the 3.5 and 5 ton units or automatic water control valve assemblies. Heating capacities appropriate for various climates are available. These Arkla units have a COP of approximately 0.53.

### Steam-Operated Absorption Units

Steam operated absorption water chillers are currently manufactured by Arkla[1], Carrier[2], and York[3]. In these indirect units, low pressure steam is used for regeneration.

All of these units used the water-lithium bromide system and are available in sizes ranging from 25 to over 700 tons. They require steam inputs of approximately 20 lb per ton-hour refrigeration. See Fig. 6. This results in a COP for the water chiller of approximately 0.6.

### Hot Liquid Operated Absorption Units

These units, also termed high temperature water units, are supplied by Carrier[2] and York[3]. They are similar to

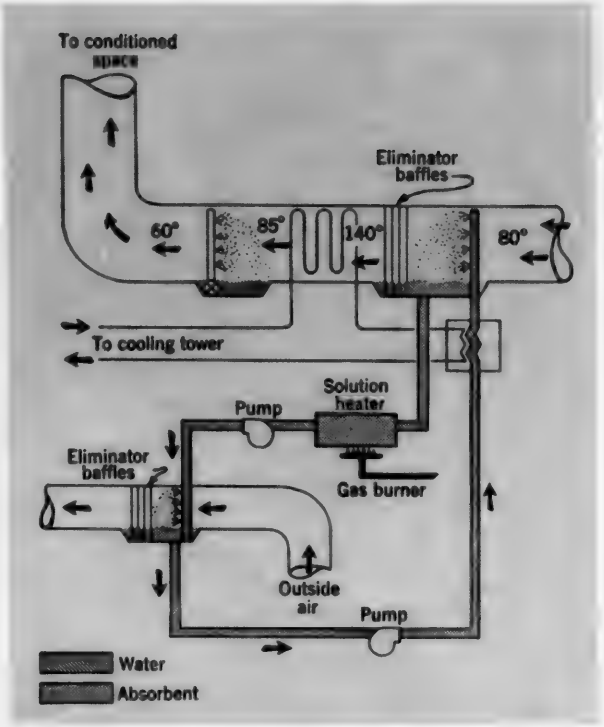


Fig. 4. Open absorption system (wet system).

the steam-operated units with minor changes to permit operation with hot liquids instead of low pressure steam. The usable liquid temperature range is from the figure of 240 to 380 deg F.

### Gas Engine-Driven Vapor Compression Units

These units are produced by Ready-Power[4] and Weatherbuster[5] in sizes ranging from 3 to 76 tons. Ready-Power also produces engine-compressor and water chiller combinations up to 150 ton capacity.

The performance ratio of gas engine units ranges from a high of approximately 0.9 for the larger engines to 0.6 for the smaller units. This means from 13 cu ft to 20 cubic feet of 1000 Btu per cu ft gas is required per ton of refrigeration.

### Steam Turbine-Driven Centrifugal Compression Units

The units are made by Carrier[2], York[3], Trane[6] and Worthington[7].

Any prime mover can be used with centrifugal compressors but they are particularly well suited to direct steam turbine drive because of their high operating speed. The centrifugal refrigeration machine consists of a centrifugal compressor, a horizontal shell-and-tube evaporator, all interconnected with a high-pressure refrigerant flow control valve or other similar means of regulating flow of refrigerant from the condenser to the evaporator.

Centrifugal systems are particularly well adapted to large capacities. The units are usually applied to installations of over 100 tons with the upper limit being about 3000 tons.

Steam consumption, Fig. 6, in pounds per ton-hour can range from a low of 13 lb per hour to a normal maximum of approximately 18 lb, depending upon the type of

**TABLE 2—MAJOR FEATURES OF LITHIUM BROMIDE ABSORPTION SYSTEMS**

*1. Utilizes low pressure steam from 2 to 14 psig. Higher steam pressures will require the use of a pressure reducing valve.
*2. No major moving parts in the refrigeration system. Easy to operate and maintain and has long life expectancy.
*3. Completely automatic.
*4. Extremely flexible. Automatic controls give smooth throttling characteristics throughout entire range from 0% to 100% of capacity.
*5. Rapid response to load changes.
*6. Economical to operate. Steam input decreases with drop in load. Uses 20 lb or less of steam per ton-hour at full load.
*7. Extremely quiet and free of vibration.
*8. Permits continuous operation of boiler plant, thus extending boiler life.
*9. Not injured by overloads. All systems include full safety control against damage.
*10. Available in a wide range of sizes, 25 tons to over 700 tons.
11. Compact and light in weight.
12. No special foundations required. Install at any location. Easy to install in either new or old structures.
13. Particularly adaptable to roof top installation.
14. High vacuum operation eliminates need for insulating chiller.
15. Uses the safest and least expensive of refrigerants—water. The permanent absorbent is a non-toxic, non-flammable salt.

*The first ten of these features also apply to ammonia absorption systems.

turbine selected and the steam pressure used. The most economical installations are those where steam is available at 100 psig or higher. Gas consumption for the boilers serving the steam turbines can range from about 17,000 Btu per ton-hour to about 24,000 Btu per ton-hour. This results in a COP of from 0.7 to 0.5.

### Dehumidification Units

Possibly the most widely used dehumidification equipment is made by Kathabar[8]. Steam, economically generated by gas, is used in the Kathabar unit for reactivating the solution which moves the moisture from the air to be dehumidified. The absorbent used in this unit is lithium chloride (a salt solution). This equipment can, under certain circumstances, be used to humidify air.

Kathabar equipment has the following fields of application:

1. Elimination of reheat
2. Prevention of frost on cooling coils, at sub-freezing temperatures.
3. Provision of air hygiene for hospitals, processing plants, office buildings and hotels.

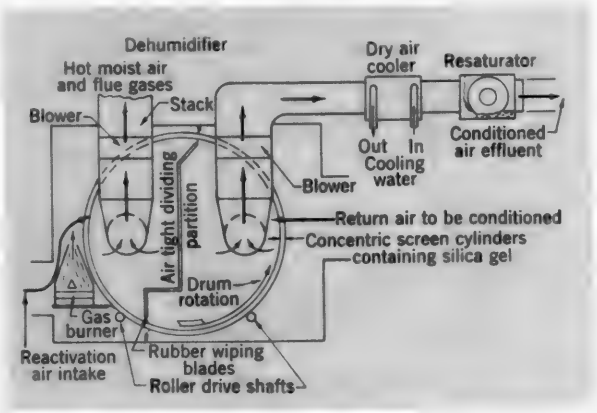


Fig. 5. Air conditioning flow diagram of dry desiccant system with dry air cooler and resaturator.

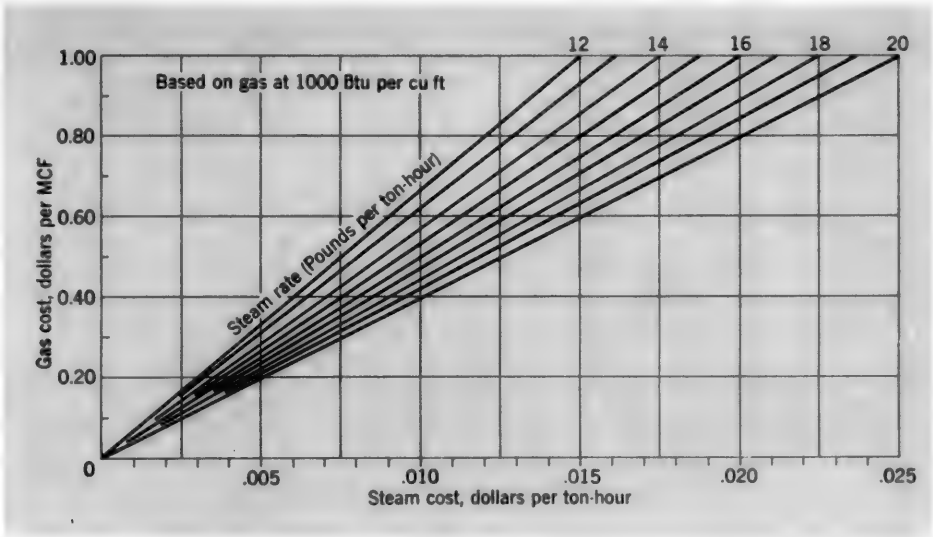


**Fig. 6. Normal rated values suitable for preliminary operating cost analyses of steam turbine and absorption system.**

The Kathabar package unit contains all necessary elements, pump, regenerator, contactor, sump, and refrigerator fan in one compact assembly. The units are available in five sizes—1100 cfm, 2500 cfm, 5000 cfm, 12,500 cfm, and 17,500 cfm. Such a unit is illustrated in Fig. 4.

An open adsorption dehumidification unit is manufactured by Bryant[9]. The unit consists basically of a hollow revolving drum constructed of two concentric cylinders of fine mesh screen containing silica gel in granular form between its walls. The interior of the drum as well as surrounding space is divided by wiper blades into two compartments which are comparatively air tight. The drum is rotated at a rate of about one revolution per 7 minutes. Air to be conditioned is circulated through one compartment, the conditioning compartment; the other compartment is the regenerator. Figure 5 illustrates the unit. The units are available with nominal air capacities ranging from 25 to 15,000 cfm. For comfort cooling, dry air coolers and resaturators are available.

The fields of application of dehumidification equipment include commercial and residential air conditioning as well as industrial processing.

## ECONOMIC CONSIDERATIONS

Operating costs of a proposed air conditioning system can only be determined accurately when all of the variable factors which affect the operation of the system are known or can be reasonably estimated.

The basic data or assumptions usually required to estimate the operating costs of similar gas and electric systems include:

1. Applicable gas and electric rates.
2. Heating value of gas in Btu per cubic foot.
3. Energy consumption of gas equipment in Btu per ton-hour or pounds of steam per ton-hour.
4. Energy consumption and demand charges of electric equipment in kilowatt-hours per ton-hour.
5. Base gas and electric demand loads.
6. Boiler efficiency.
7. Total operating hours.
8. Water consumption and rates.
9. Man-hours and labor cost of operating personnel required.
10. Maintenance requirements.
11. Equivalent full load hours.
12. Amortization on original investment.
13. Taxes.
14. Interest.
15. Number of machines to be specified.

Studies, considering all the above factors of proposed alternate gas or electric systems, will frequently show that the gas air conditioning system has a lower operating and ownership cost.

In many cases, however, the main factor influencing an economic comparison of gas and electric units is the operating cost of the prime mover. Therefore, in order to provide a convenient method of estimating the comparative costs of gas and electric energy, a gas vs. electric break-even chart has been prepared as Fig. 7. This shows what an electric rate must be to break-even with a given gas rate for the system being compared.

Following is a variety of gas and electric input rates to cover the many types and sizes of air conditioning equipment available.

| *Representative Gas Inputs—Thousands Btu per Ton-hr* | |
|---|---|
| Arkla "All Year" units | 23 |
| Large tonnage absorption units | 27 |
| Large turbine drive units | 21 |
| Weatherbuster units | 20 |
| Ready-Power units | 13 |
| Arkla water chiller | 27 |

| *Representative Electrical Inputs—KW per Ton* | |
|---|---|
| Window type units | 2.0-2.6 |
| Central residential units | 1.2-1.6 |
| Commercial type units | 1.0-1.3 |
| Large industrial units | 0.8-1.1 |

An example of the use of the chart follows:

*Example.* A proposal is made to install a 75-ton gas-operated unit in a new building. The specifications do not give any type of equipment an advantage. The gas

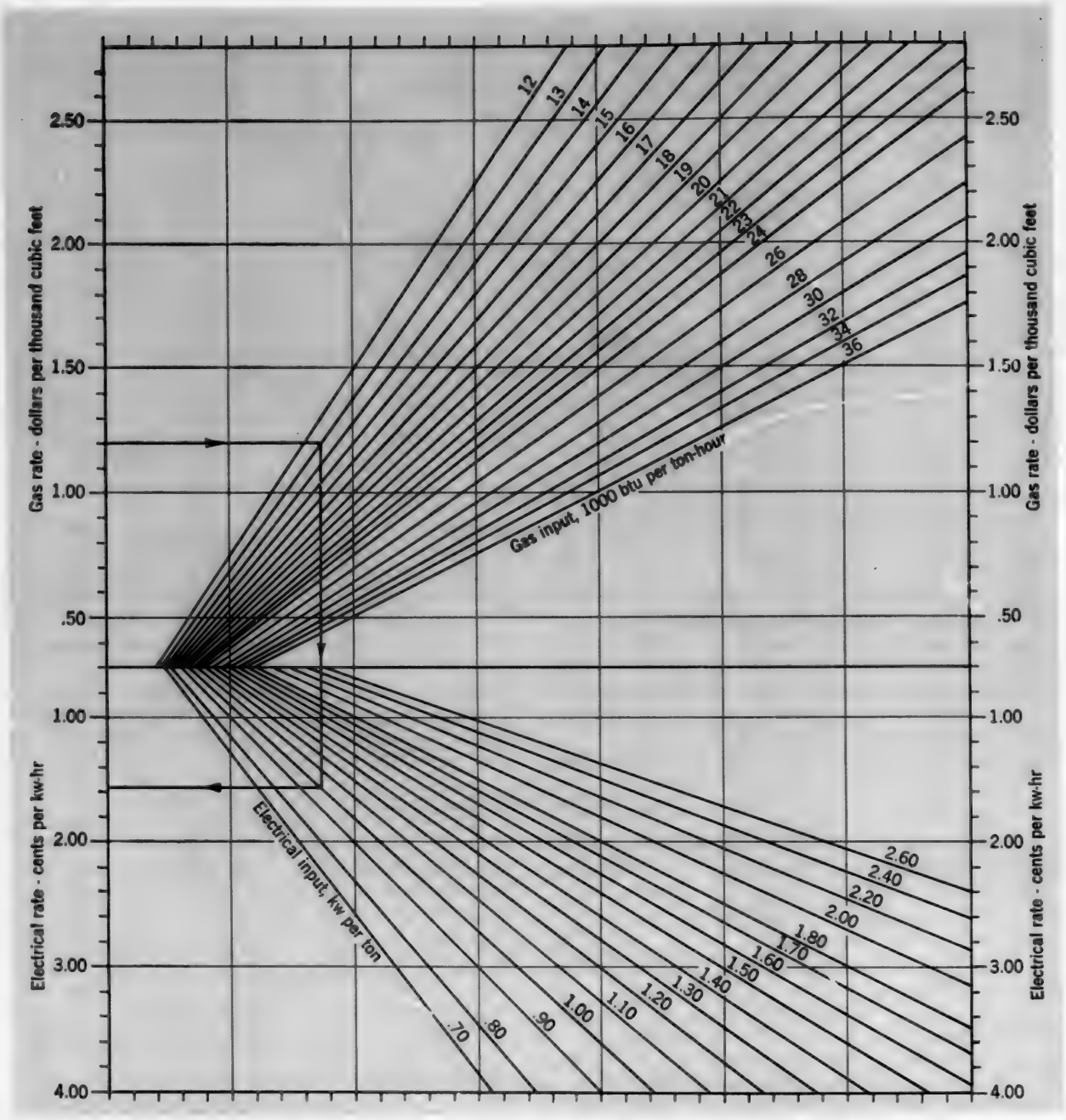


**Fig. 7. Gas-electric break-even chart. This is based on gas at 1000 Btu per cu ft and with electric demand charges included in the rate for electricity.**

rate is $1.20 per thousand cubic feet; the electric rate, including demand charge, is 2 cents per kilowatt-hour. How do the two rates compare?

*Solution.* Assume that the final choice rests between a Ready-Power unit and an electric motor-driven unit. The gas consumption is shown (in the representative list of gas inputs) as 13 MBtu per ton-hour. The electric input is given for Fig. 7 (in the representative list of electic inputs) as being in the range of 0.8-1.1 kw per ton. Let us assume the proper rate for this example is 1 kw per ton. Refer to Fig. 7, where this problem is illustrated.

Enter the chart at $1.20 gas rate at the left and move horizontally to the right to the proper gas input line, 13,000 Btu per ton-hour. From this point, move vertically downward to the proper electrical input line, 1.0 kw per ton. From this point proceed horizontally to the left and find on the electric rate scale that the break-even electric rate is 1.55 cents per kwh.

At the break-even point, the energy costs are the same. Since, in the example, the actual electric rate is higher than this break-even rate, the electrical operating costs are higher than the operating costs with gas. The example solution shows that gas should be used.

## Other Considerations

A comparison of operating costs of steam absorption

## TABLE 3—COOLING TOWER SELECTIONS

| Cooling Capacity, Tons | Heat Rejection, M-Btuh | Cooling Water | | Design Wet-Bulb, Deg F | | | |
|---|---|---|---|---|---|---|---|
| | | Gallons per Minute | Inlet Temp., Deg F | 70 | 75 | 78 | 80 |
| 25 | 800 | 75 | 85 | | | | 12 x 7 x 8<br>1 @ 3 9,000 |
| 50 | 1,600 | 150 | 85 | 14 x 7 x 8<br>1 @ 3 11,000 | 14 x 7 x 8<br>1 @ 5 11,000 | 16 x 9 x 8<br>1 @ 5 14,600 | 16 x 9 x 8<br>1 @ 5 14,600 |
| 75 | 2,400 | 225 | 85 | 16 x 9 x 8<br>1 @ 5 14,600 | 16 x 9 x 8<br>1 @ 7½ 14,600 | 16 x 13 x 8<br>1 @ 7½ 20,500 | 18 x 13 x 8<br>1 @ 7½ 22,100 |
| 100 | 3,200 | 300 | 85 | 16 x 9 x 8<br>1 @ 7½ 14,600 | 18 x 13 x 8<br>1 @ 7½ 22,100 | 18 x 13 x 8<br>1 @ 10 22,100 | 18 x 17 x 8<br>1 @ 10 28,500 |
| 125 | 4,000 | 375 | 85 | 18 x 13 x 8<br>1 @ 7½ 22,100 | 18 x 17 x 8<br>1 @ 7½ 28,500 | 18 x 17 x 8<br>1 @ 15 28,500 | 20 x 17 x 8<br>1 @ 15 33,000 |
| 150 | 4,800 | 450 | 85 | 18 x 13 x 8<br>1 @ 10 22,100 | 18 x 17 x 8<br>1 @ 15 28,500 | 20 x 17 x 8<br>1 @ 15 33,000 | 18 x 25 x 8<br>2 @ 7½ 41,900 |
| 200 | 6,400 | 600 | 85 | 18 x 17 x 8<br>1 @ 15 28,530 | 18 x 25 x 8<br>2 @ 7½ 41,900 | 18 x 25 x 8<br>2 @ 10 41,900 | 18 x 33 x 8<br>2 @ 10 54,800 |
| 250 | 8,000 | 750 | 85 | 18 x 25 x 8<br>2 @ 7½ 41,900 | 18 x 33 x 8<br>2 @ 7½ 54,800 | 18 x 33 x 8<br>2 @ 15 54,800 | 20 x 33 x 8<br>2 @ 15 63,600 |
| 300 | 9,600 | 900 | 85 | 18 x 25 x 8<br>2 @ 10 41,900 | 18 x 33 x 8<br>2 @ 15 54,800 | 20 x 33 x 8<br>2 @ 15 63,600 | 21 x 25 x 17<br>2 @ 20 79,500 |

Notes: The following information is given under "Design Wet Bulb" for the various size cooling towers. The top line in each of these boxes gives the measurement of unit-length, width and height. At the lower left is number of motors and the horsepower of each; the figure at the lower right is the wet weight of the unit in pounds.

The selections are based on forced draft equipment manufactured by the Marley Company and are intended for preliminary analysis only. For design data consult the cooling tower manufacturers' catalogs.

and steam turbine-centrifugal compression units should be made on the basis of an overall heat balance.

The summer use of boilers to operate steam air conditioning systems is entirely practical. This also avoids the need to shut down the steam heating plant in the cooling season when no requirement exists for heating steam. According to boiler authorities, year-round operation of a boiler will reduce maintenance costs and will add to its life.

When boilers are already installed there can be more rapid amortization of the cost of the steam operated air conditioning system because nearly all of the boiler cost is chargeable to the heating system.

Other advantages of summer boiler operation include having steam available for such uses as reheat, cooking, and water heating. When light load boiler operation is required in the summer, more efficient operation can be attained through an improved boiler load factor with a steam air conditioning system.

### When Gas Is Favored

The principal considerations which will favor gas in an economic comparison of proposed gas and electric systems can be summarized by the following five important considerations:

1. Lower energy costs per ton-hour.
2. Sizable saving in first costs through reduction in size of electric service entrance, transformers, power control centers, and wiring.
3. Reduction of electric demand charges when using gas.
4. Improvement of boiler load factor with the boiler being in year-long use.
5. Lighter floor loadings where vibrationless absorption equipment is installed on upper floors or roof-top locations.

## LITHIUM BROMIDE ABSORPTION SYSTEMS

The major features, specifications, applications and limitations which follow apply to all makes of lithium bromide absorption systems. Detailed information on the specific manufacturers' systems follow the general specifications. This latter information is presented to enable the mechanical engineer and contractor to recognize the requirements of each manufacturer and to assure the owner of the most satisfactory system installation that is possible.

Table 3 has been prepared as a guide in cooling tower selection. Figure 2 shows a schematic layout of a typical lithum bromide absorption machine.

### Applications

Lithium bromide absorption systems are applicable whenever chilled water in the temperature range of 40 deg and above is required for air conditioning or process cooling. Applications include hotels, motels, hospitals, office buildings, industrial plants, churches, schools, and others.

Absorption systems are particularly suitable (1) whenever low pressure steam is economically available; (2) whenever high temperature hot water is used for heating; (3) whenever widely fluctuating loads are encountered

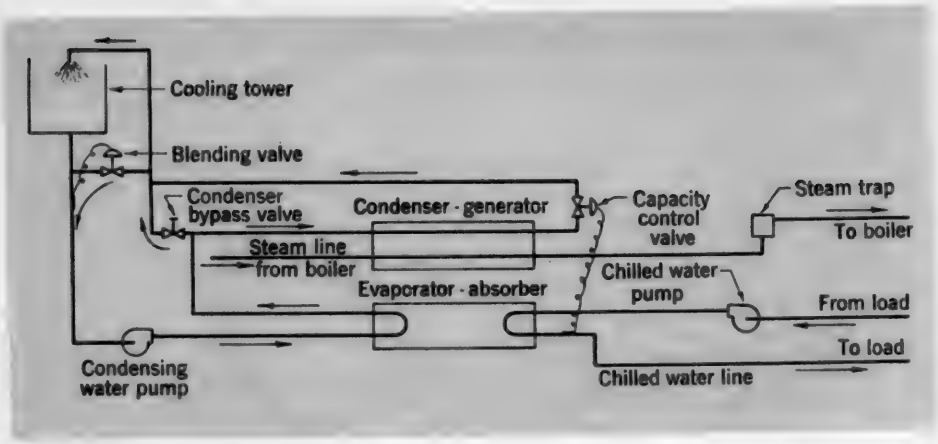


**Fig. 9. Diagram of flow through Carrier absorption unit.**

such as intermittent process cooling in bottling plants, and certain industrial and comfort air conditioning applications; (4) whenever local codes require licensed operators for other types of systems; and (5) for roof top installations where steam is available and where long runs of wiring would be required for electrically-driven equipment.

A limitation of the lithium bromide absorption system is that it cannot produce chilled water at temperatures lower than 40 deg.

The major features of lithium bromide absorption systems are summarized in Table 2.

### Sample Specifications, Lithium Bromide Absorption Systems

Furnish and install as shown on plans —— Model —— steam-actuated absorption system(s) (each) having a capacity of —— tons of refrigeration when cooling —— of water from —— deg F to —— deg F. The over-all heat transfer coefficients for absorber, condenser, and evaporator shall allow for a thermal resistance of —— deg F per Btu per hour per sq. ft. for fouling of the water side of the tubes.

Pressure drop through the evaporator shall not exceed —— psi. Machine shall be supplied with —— gpm of cooling water for condenser-absorber at —— deg F maximum; the pressure drop through the machine not to exceed —— psi. Steam shall be supplied to the automatic steam valve inlet connection (or generator flange) at —— psig dry and saturated, and at a minimum rate of —— pounds per hour.

Each absorption system shall be complete with absorber, evaporator, generator, condenser, solution heat exchanger, necessary solution, refrigerant and purge pumps, all inter-connecting piping and initial charge of solution.

The manufacturer shall furnish all necessary electrically or pneumatically actuated safety and operating control instruments together with a steam or water capacity control valve. Compressed air, if required, shall be provided by others, at 15 psig. Pumps shall be furnished for operation on —— volts, —— phase, —— cycle electric current. The electrical contractor shall consult with the equipment manufacturer for sizes of pumps and electrical wiring and starter requirements.

The chilled water and condensing water circuits shall be satisfactory for water working pressures of —— psig.

The foregoing general specifications covers all types of absorption equipment. For detailed information on installation, supervision and instruction, consult with the equipment manufacturer.

### Arkla System

The chiller provides 40 deg chilled water for all types of chilled water applications. Wide industrial use as well as extensive commercial applications prove the adaptability of this equipment. In designing systems using these chillers, several features are noted. Steam from gas boilers activate the unit. Any steam pressure from 3 to 15 psig can be used. In many applications this permits the economic recovery of heat from waste steam. Steam inlet pressure for this system should be relatively constant.

Condensing water may be supplied from wells, lakes, or cooling tower; however, water treatment is usually desirable to eliminate corrosion or erosion. Condensing water should be maintained above 70 deg and this is usually accomplished by means of a 3-way blending valve which allows the water to bypass the cooling tower until the 70 deg temperature is reached. Cooling towers should be sized in order to dissipate the heat of activation as well as the heat taken from the area to be cooled. See Table 3.

All condensate lines are vented to atmosphere and are collected for return to the boiler. Three points on each chiller collect condensate: At the steam valve, at the diverter valve, and at the generator. Only clean, dry steam is provided to the chiller generator.

In year-round operation, the steam that activates the cooling cycle can be easily converted to hot water for the heating cycle. A standard steam-to-hot-water heat exchanger accomplishes this. The same equipment, piping, pumps and other accessories in the majority of cases can be used for either cycle. An expansion tank as well as air relief valves should be placed at the high points of the system; the size of the tank will depend on volume of water and size of system.

Controls operate on 115-volt, 60-cycle single phase current, and should be fused with a 15 amp disconnect. The control can be completely assembled at the factory or may be built up as the designer requires, allowing for local variation or design prerogatives.

In general, all standard practices now employed in the air conditioning industry are applicable to Arkla

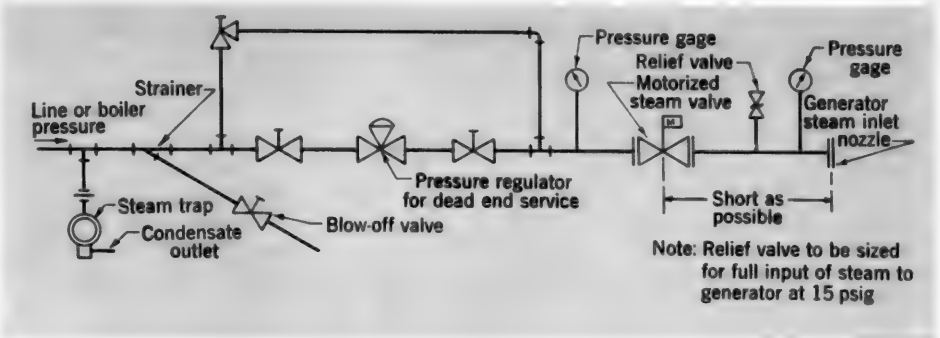


**Fig. 9. Steam supply piping for York absorption system.**

chillers making them extremely easy to include in a system and to install.

### Carrier System

This absorption machine is composed of four major heat exchangers—absorber, evaporator, generator, and condenser. The first two occupy the lower (absorber) shell and the last two occupy the upper (generator) shell. See Fig. 8.

The condensing water system is an important part of the setup. Heat rejection occurs both in the absorber and the condenser (piped in series) with water going first to the absorber. This series flow and series heat rejection causes condensing water full load temperature rise to vary from 15 to 20 deg. Total pressure drops range from 8 to 19 psig, with an average of about 15 psig.

The condenser circuit requires less condensing water than the absorber and also incorporates a throttling valve for capacity control. Consequently, condensing water from the absorber passes in part through the condenser and capacity control valve and in part through a condenser bypass. The piping then rejoins and is directed to the cooling tower. Full load condenser flow is two-thirds of the condensing (absorber) flow and can be throttled to zero according to capacity requirements. The condenser bypass valve is preset to provide fairly constant flow through the absorber at all times.

The capacity control valve is an electric motor driven modulating valve. It is governed by an amplified signal from a resistance thermometer located in the leaving chilled water line.

Although 60 to 95 deg is the usual selection range for entering condensing water temperatures, the machine can be operated with the temperature anywhere from 95 to 32 deg. Once the temperature has been selected, however, it is essential that it remain fairly constant. A blending valve can be utilized for this purpose, mixing discharge water with cooling tower water to maintain the entering condensing water temperature during conditions of part load or low wet bub temperature.

The evaporator is located in the upper half of the absorber shell, and is connected to a conventional chilled water circuit. Normal leaving chilled water temperatures range from 40 to 52 deg with rises of from 7 to 12 deg.

The machine normally operates on 2 to 12 psig steam with 10 and 12 psig being most common. High pressure steam can easily be adapted by use of pressure reducing valves or steam-to-hot water interchangers. Steam pressure should be maintained constant ($\pm$ 1 psig) by the boiler controls.

Where the absorption machine is located on a steam line or boiler common to other equipment, it is often prudent to install a back pressure regulator valve in the absorption steam line. The valve will restrict flow to the absorption machine at start up and maintain boiler pressure as it adjusts to the new load condition.

Return of condensate to the boiler can be achieved by conventional systems. Use of an inverted bucket steam trap is recommended and return of condensate at atmospheric pressure is satisfactory.

Hot water at 380 deg or lower is an excellent heat source for generation. It permits simple and accurate capacity control as well as excellent part load performance. With hot water, the capacity control valve is located in the hot water line. This results in a substantial reduction in condensing water pressure drop.

The unit can be made completely automatic by using a timer or thermostat to start and stop the machine. Often the manual controls are limited to a single push button. In these cases, the controls are a factory designed integrated system composed of electronic, electric and pneumatic devices (all-electric systems are available). They are powered by 115-volt, 1 phase, 50 or 60-cycle electricity and a small 15 psig air line. Other control systems are applicable by using manual starters for such items as chilled and condenser water pumps.

The machine has no major moving parts to cause excessive noise or vibration. It touches the floor at only four points and is normally installed on a $\frac{3}{8}$ inch layer of shearflex. However, if the chilled water and condensing water pump require a foundation to absorb vibration, isolation should be used to prohibit pump vibrations from passing through the absorption machine to the building. Machine isolation should not be necessary if flexible piping is used between the absorption machine and the water pumps.

Insulation is desirable for the absorption machine chilled water heads and refrigerant piping. Its main purpose is to prevent sweating. Other areas do not need insulation if adequate ventilation is available for removing machine room heat.

### York Lithium Bromide System

This system consists primarily of an upper shell containing a generator and condenser, a lower shell containing a chiller and absorber, and a heat exchanger.

The Baudelot method is used for distributing lithium bromide solution over the generator, and absorber tubes as well as refrigerant (water) over the cooler tubes, in order to minimize pumping requirements and noise.

## TABLE 4—MAJOR FEATURES OF AMMONIA ABSORPTION SYSTEMS

Features consist of the first 10 listed in Table 2 plus the following:

1. Systems require no building enclosure. They are designed for on-the-ground, out-of-doors installation.
2. Has only one moving part, a small aqua (ammonia and water solution) pump.
3. Fully automatic. It is designed to operate unattended for long periods of time.
4. May use any form of heat—direct gas-fired, steam, or hot fluids.
5. Can provide refrigeration at different temperature levels simultaneously.
6. May be used for water or brine cooling as well as for furnishing ammonia refrigerant to remote evaporators.
7. Not affected by slop-over or wet suction gas from evaporators.
8. Ammonia and water solution is chemically basic and therefore relatively non-corrosive.

Twelve systems are available in a capacity range from 106 to 740 tons.

Field requirements for installation are as follows:

*Space.* Provide at one end equal to length of the shells, to permit tube cleaning. A door or window is satisfactory.

*Foundations.* A means of support should be supplied capable of supporting the operating weight of the system. This can be an ordinary floor or a built up structure. Rubber isolation is suggested at the four points of support if it is necessary to isolate the piping system from the structure.

*Electric Wiring.* These systems are provided as standard with electric controls and therefore do not require compressed air. The three pump motors are furnished with factory mounted and wired starters and may be supplied for either 208, 220, 380, 440 or 550-volt, 3-phase, 50 or 60-cycle current. The factory mounted and wired control box is equipped with a variable transformer to reduce any one of the above voltages to 24 volts for the control circuits.

The solution and refrigerant pumps are factory wired to their respective starters in the control box. Refrigerant pump motor sizes are as follows: 1 hp on systems from 106 to 333 tons, 1½ hp for systems from 396 to 740 tons. Solution pump motor sizes are 1 hp for 106 to 169 tons, 1½ hp from 217 to 330 tons, 2 hp from 396 to 457 tons, and 3 hp from 526 to 740 tons. A ¾-hp purge pump is used for all systems. The starter is factory mounted and wired.

Field wiring for the system requires: Connecting 3-phase power supply to the control box; running 3-phase power from control box to purge pump motor; running 24-volt wiring from control panel to steam control valve and to the interlocks on the chilled water and condenser water pump starters, and running interlock wiring between the control panel and the chilled and condenser water pump starters.

Chilled and condenser water pump starters may be any of the foregoing voltages.

*Steam Piping.* Capacity of the system is controlled by a 24-volt modulating type valve in the steam supply line to the generator. A steam trap should be installed in the steam supply line to the generator to assure dry steam to the generator at all times. See Figure 9.

The condensate outlet from the condenser should be piped through a steam trap to an open drain or to the boiler feed tank.

For high temperature water applications, motorized 3-way hot water control valve and a full size bypass around the generator is used.

*Condenser Water Piping.* Condenser water piping connections are limited to an inlet connection to the absorber and an outlet connection from the condenser. The interconnection between the absorber and condenser is furnished with the system.

To limit the variation in temperature of entering condensing water, as might exist with a cooling tower, an automatic 3-way control valve is recommended to bypass the cooling tower.

*Insulation.* To prevent sweating, the chilled water heads, the refrigerant (water) pump and connections should be insulated. Insulation may be provided for the lower shell (absorber and chiller) when unusually high ambient conditions are encountered; however, it is not required.

Chilled water piping should be installed in accordance with conventional practice. There are no unusual requirements for an absorption system that must be taken into consideration.

## AMMONIA ABSORPTION SYSTEMS

### Applications

Ammonia absorption systems are most suited for installation at industrial plants requiring process liquid or gas cooling or freezing operations, such as at chemical plants, refineries, and food freezing plants.

When air conditioning is required for factory or office areas, a multi-stage system can be used to furnish chilled water as well as the refrigeration at a lower temperature level for process cooling or freezing.

The required temperature level of the heat source is dependent upon the desired evaporator temperature level and upon the number of stages. Thus, the absorption system is capable of producing useful refrigeration with many forms of heat that would otherwise be wasted.

These features and characteristics will suggest many applications where an ammonia absorption system will prove advantageous.

To produce an evaporator temperature of —40 deg, a single stage system would require a temperature source of 350 deg, a double stage would require 250 deg. An evaporator temperature of 0 degrees could be produced with a double stage system using a heat source of 210 degrees.

### York Ammonia Absorption Systems

An ammonia absorption system is manufactured by York[3]. This system is most generally applicable for process requirements and brine cooling at temperatures well below 40 deg.

Features of the ammonia absorption system include the first ten listed in Table 2 as also applying to lithium bromide systems, plus the features listed in Table 4.

Steam turbines as used for driving centrifugal compressors can be grouped into three types, as follows:

### Condensing Type Turbine

This is the most commonly used steam turbine and will operate with steam at almost any pressure. It is relatively simple in operation and easy to lay out and install. It is readily available in a wide range of speeds and horsepowers.

### Non-Condensing Type Turbine

This turbine acts as a reducing valve for high pressure steam. It is a popular selection where the low pressure exhaust steam has other applications, such as process work. In these cases, the turbine fits into the heat balance system of the industrial plant or commercial building with little cost for its motive energy.

### Variable Pressure, Bleeder Type Turbine

This is, in effect, a combination of the previous types and is used where the steam source may be variable. Higher initial costs are normally offset by the flexibility of this turbine to fit into the varying steam supply situations which frequently exist in industry, hotels, hospitals and other types of projects.

### Boilers, Piping and Pumps

Certain points relative to boilers, piping, and pumps should be noted. Steam boilers installed for cooling requirements can also be used for heating. Varying climatic conditions and the many different factors comprising the internal cooling load make it necessary that each project be individually examined to determine whether the steam requirement will be greater for cooling or heating. The initial investment costs chargeable to heating and to cooling and to other steam uses will depend upon such determination.

High pressure steam is needed with most standard types of turbines used with centrifugal compressors. High pressure systems are in favor in most areas to meet the steam uses of hospitals, hotels, industry and large commercial and public buildings of all types.

Steam and condensate return piping must be included with the steam turbine system. Steam piping costs, including insulation, are usually an added initial expense.

Condensing water and steam condensate return pumps using steam turbine drive are increasing in popularity. Pumps are being designed for higher speeds and a turbine makes an ideal prime mover.

Table 3 has been prepared as a guide in cooling tower selection.

### Advantages

Among the advantages of the steam turbine-driven system are those based on the advantages of the turbine, and include the following:

Modern turbines are rugged, durable, dependable and simple to operate and maintain. New alloy turbine blades will last almost indefinitely with steam pressures up to 300 psig.

High speed range, flexibility and ease of turbine speed control and compactness makes direct drive practical.

Centrifugal action of both compressor and turbine results in minimum vibration.

Low cost maintenance is assured by the simple steam powered rotary motion and the small number of moving parts.

Economy of operation results from the direct use of steam power generated by low cost natural gas.

The steam turbine has a wide range of over-load tolerance.

Steam turbines excel with centrifugal compressors because they are well suited to the higher shaft speeds of modern compact equipment design.

Relatively small floor space is required.

Light weight due to high speed operation.

Have exceptionally good partial load performence, down to approximately 10% of normal load.

Easy to control output.

### Sample Specifications, Steam Turbine-Driven Centrifugal Compressors

Furnish and install, where indicated on the plans, centrifugal water cooling refrigeration system(s). The (each) system shall produce a capacity of not less than —— tons of refrigeration in cooling —— gpm of water through the cooler from an entering temperature of —— deg F to a leaving temperature of —— deg F when the condenser is supplied with —— gpm of water at an entering temperature of —— deg F. The overall heat transfer coefficients for both the cooler and condenser shall allow for a thermal resistance of —— deg F per Btu per hr per sq ft for fouling of the water side of the tubes.

The (each) system shall consist in general of: (a) compressor, (b) refrigerant condenser, (c) water cooler, (d) steam turbine prime mover, each as specified as follows:

*Compressor.* Compressor shall be of the centrifugal type, having statically and dynamically balanced multistage impeller. Impeller shall be constructed of materials to resist erosion and corrosion and preserve the wheel balance and initial impeller performance characteristics.

Impeller shaft shall be of forged steel with sufficient rigidity to prevent whip or vibration at operating speeds required to deliver specified capacities. Bearings shall be readily accessible for maintenance and replacement. A separate thrust bearing shall be provided to position the shaft and absorb either residual or the main axial thrust along the shaft. Means shall be provided for bearing temperature measurement.

Lubricating system shall be of the forced feed type supplying oil under pressure to all rubbing surfaces—main bearings, thrust bearing and the shaft seal. Provide oil filter and water-cooled oil cooler.

An oil pressure type of shaft seal shall be provided to prevent air leakage in, or refrigerant leakage out. at the point where the rotating shaft passes through the

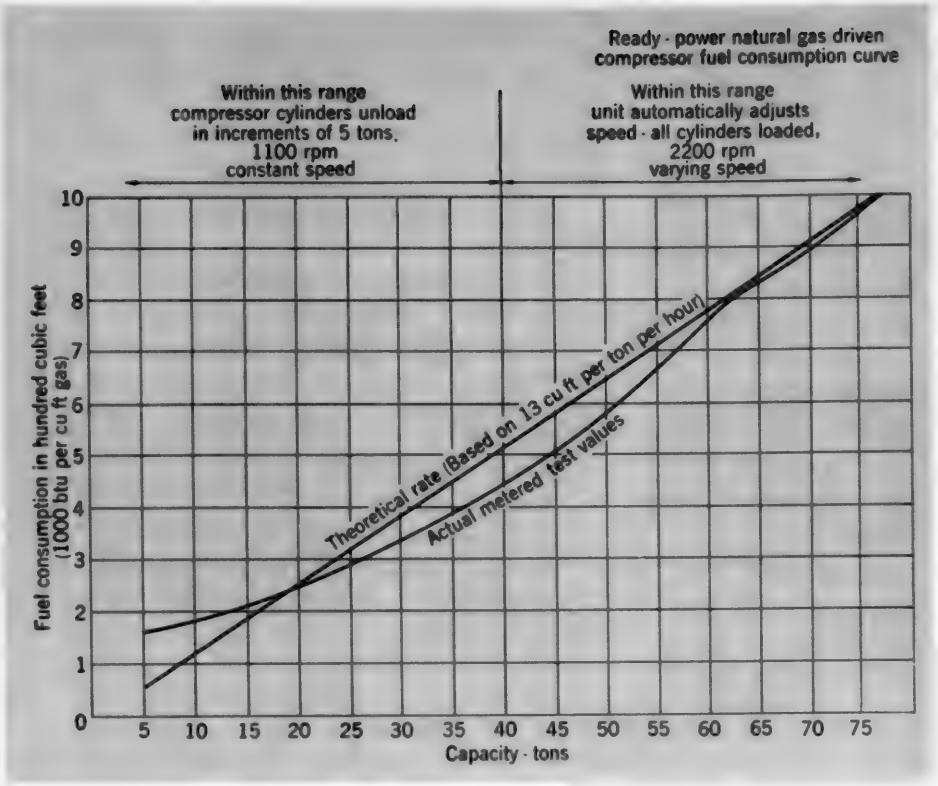


**Fig. 10. Fuel consumption curve for Ready-Power natural gas engine driven compressor.**

compressor housing. Seal shall be effective to prevent air leakage or gas loss whether compressor is operating or shut down.

*Refrigerant condenser.* Refrigerant condenser shall be multi-pass, horizontal and of the shell and finned tube type. The steel shell shall have fusion welded seams; tubes and tube sheets shall be non-ferrous. The water side of the condenser shall be designed for a minimum of —— psig water working pressure; the refrigerant side for —— psig. The condenser shall be constructed in accordance with Paragraphs U-69, U-65 and U-66 respectively of the ASME Code for Unfired Pressure Vessels.

When supplied with —— gpm of water, the water pressure loss through the condenser shall not exceed —— psig. and the water velocity through the tubes shall not exceed —— ft per sec.

*Water cooler.* Water cooler shall be of the same type construction as outlined for the refrigerant condenser and shall comply with ASME Code requirements as specified for the refrigerant condenser. When supplied with —— gpm of water, the water pressure loss through the water cooler shall not exceed —— psig and the water velocity through the tubes shall not exceed —— ft per sec. The cooler shall be designed for a water working pressure of —— psig.

*Inter-stage cooler.* For multi stage systems, an inter-stage refrigerant cooler shall be provided, either integral with or external to the water cooler (evaporator), for the purpose of cooling the condensed refrigerant liquid at the intermediate stage pressure. The resulting flash gas shall be piped to the inlet of the intermediate stage impeller wheel. Provide necessary float valves to automatically regulate the flow of condensed liquid through the inter-cooler to the evaporator.

*Steam turbine drive.* Furnish a steam turbine suitable for direct connection to the compressor, having a capacity of 10% greater than the compressor brake horsepower requirement at full load condition. Turbine shall be complete with non-corrosive steam strainer, sentinel warning valve, forced feed lubrication, oil cooler, oil reservoir, oil relief valve, oil piping, oil pressure gage, tachometer, gland seal piping for condensing turbine (or provisions for drain line supplied on non-condensing turbine). Turbine shall be complete with (manual) (automatic) speed control. An overspeed trip governor shall be supplied to cut out at not over 115% designed speed. Provision shall be made for stopping the turbine upon operation of the compressor safety devices and upon power failure by use of either a solenoid operated valve in the low oil pressure trip circuit or a solenoid trip on the emergency overspeed governor. Furnish wrenches for special bolts and nuts and suitable mounting feet or pedestals so that a simple foundation can be utilized. If manual, turbine shall be governed by an orifice type hydraulic constant speed governor, with manual speed adjustment range of approximately 25%. If automatic, turbine shall be governed by a pneumatically controlled hydraulic governor with a manual control effective during automatic operation and during failure of air supply. The pneumatic valve to be actuated by temperature controller with the sensitive element located in contact with the cooled liquid.

Turbine shall be designed to operate at —— psig and —— deg F superheat at the turbine throttle with an exhaust pressure of —— psig.

Furnish a surface type steam condenser for operation

in conjunction with this steam turbine. Condenser to be complete with —— stage air ejector, inter and after condensers, condensate pump with electric motor (steam turbine) drive, atmospheric relief valve and copper expansion joint.

When supplied with —— gpm of water entering, the condenser shall be of sufficient capacity to produce an exhaust pressure of —— inches mercury for the steam turbine. Water pressure drop through the condenser shall not exceed —— psig.

## NATURAL GAS ENGINE DRIVEN REFRIGERATION MACHINES

Natural gas engine refrigeration machines consist of a heavy duty industrial type gas engine coupled to a compressor. The major characteristics of these units include low operating cost and a high degree of flexibility in some models by combining speed variation with cylinder unloading.

Units of this type are made by Ready-Power[4] and Weatherbuster[5]. The Weatherbuster units are available in sizes from 3½ to 10 tons. They are air-cooled, direct expansion units.

### Ready-Power System

Ready-Power compressor units range in size from 20 to 76 tons in single units. Fuel consumption of such a unit is shown in Fig. 10. All compressors are fully automatic. Matching water chiller-condenser packages are available in standard packages up to 150 tons. Larger sizes are available on request.

The following design consideration should be observed when designing any engine driven system:

*Engine Exhaust Piping and Muffling*

Exhaust lines must be vented out of doors or into flue. The gas engine cycle is essentially a combustion process. Therefore, adequate provision must be made for combustion air access into the equipment room.

*Ventilation of the Equipment Room*

This should be accomplished by small exhaust fan or installation of the exhaust piping through a 10-inch or 12-inch galvanized duct up and out to achieve natural draft venting.

*Noise*

Equipment room noise is slightly higher than that of most electric units of the same tonnage. Maxim residential silencers or the equal should be specified. Occasionally, the equipment room would require special insulation.

*Suction Line Piping*

Risers should be selected so as to give 1500 fpm gas velocity at minimum load. Dual risers should be used where coil sections exceed 10 tons and piping must rise leaving evaporator coil.

*Tower Size*

The cooling tower should be selected on a basis of 1.33 to 1.4 times the evaporator coil load in order to allow for engine heat rejection and still maintain cooling tower water temperatures.

*Evaporator Coil Selection*

On coils over 10 tons capacity, specify that the coil be split in order to permit operation at light loads—or specify pilot operated thermal expansion valves on larger single section coils. An example of the breakdown of the coil sizes for a 50-ton system would be coils of 25 tons, 15 tons, and 10 tons.

*Power Wiring Requirements*

Three No 10 AWG wires with 30 amp fused disconnect for 208 to 230 VAC, for three-phase or single phase current.

### Sample Specifications for Natural Gas Engine Driven Refrigerating Machines

The refrigerating compressor shall be of the reciprocating type. Compressor shall have a rating of not less than —— tons at —— deg F condensing temperature and —— deg F evaporating temperature, at 2400 rpm and using Refrigerant No. —— (12 or 22). It shall be direct connected to an industrial type 6-cylinder engine having sufficient horsepower to turn the compressor at sufficient speed to develop full capacity and to drive the condensing water circulating pump.

The engine shall be equipped for natural gas fuel and shall have automatic temperature control, automatic crank case oil make-up and low oil pressure and high temperature safety controls. The compressor shall be equipped with full flow oil filter, oil separator, automatic oil tank heater and suction line strainer, suction and discharge valves.

The unit shall be equipped with type "A" controls. Automatic capacity controls shall vary speed of the engine from full to half speed and then unload cylinders to give a capacity range of from —— to —— tons. Automatic start-stop controls shall include automatic operation from a stat or switch.

The unit instrument panel shall include engine oil pressure and water temperature gages, compressor suction, oil and discharge gages, compressor oil pressure and high-low safety switches, safety release switch, suction pressure limiting switch and suction limiting valve.

The interlock control cabinet shall be wall mounted and shall include main switch, pump down switch, running time meter, cranking motor relay with overload protection. 208-24V transformer and terminal boards. Auxiliary equipment shall include a Maxim residential type silencer, flexible exhaust line section, flexible fuel line, suction and discharge line vibrasorbers and front and power take-off with 7.88 pitch diameter for driving condenser water pump. Condenser water pump shall be —— centrifugal pump with 11-inch pitch diameter pulley, 2 groove B-section. Belts shall be B-section R-M Segmetic or equal.

### References


1. Arkla Air Conditioning Corp., Little Rock, Ark.
2. Carrier Corp., Syracuse, N. Y.
3. York Corp., sub. of Borg-Warner Corp., York, Pa.
4. The Ready Power Company, Detroit, Mich.
5. The Weatherbuster Corp., Camden, Ark.
6. The Trane Company, La Crosse, Wis.
7. Worthington Corp., Harrison, N. J.
8. Kathabar Division, Surface Combustion Corporation, Toledo 1, Ohio.
9. Bryant Industrial Products Division, Carrier Corp., Cleveland 28, Ohio.

# Toxicity and Fire Potentialities of

# Common Chemicals in Industry

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**This article is written for the industrial plant too small to employ a safety engineer or an industrial hygiene engineer but which, nevertheless, requires guidance to promote health and safety of plant personnel and to prevent fires as the result of the chemicals or processes used. Since it is impossible, because of space limitations, to mention the ever-increasing number of chemicals produced or used in industry, emphasis is placed on common industrial chemicals and normal manufacturing processes. This is Part 2 of a two-part article.**

WITHIN the past five years a new series of synthetic resins have been developed. Main applications at present seem to be centered in the electrical industry for so-called "potting operations," supplanting the use of pitch. Another progressively expanding application is bonding or cementing metal to metal or practically any combination of synthetic and organic material.

### Epoxy Resins — Amines — Isocyanates

By themselves, the epoxy type resins are only moderately potentially dangerous due to skin contact. The effectiveness of the resin use is the addition, in a regulated quantity, of a hardener or catalyst of usually an amine type. Depending upon the types of materials mixed and the formulation used, setting or hardening of the mixture may occur within a few minutes or after several hours of chemical reaction.

Present information indicates that there may be no inhalation problem involved. The main and most serious problem is that due to skin contact which produces a severe dermatitis. This occurs when the fluid ingredients are handled without hand protection and is due to the alkalinity of the mixture. After setting or hardening, there is no further exposure from these materials. The neutral reading of an acid or alkaline solution as indicated on a color chart or other laboratory check is a pH of 7 or 7.5. Some of the mixed epoxy resin formulations indicate a pH of 10 or more. This high alkalinity has a serious effect on the skin, and dermatitis usually results.

The item of susceptibility is the greatest deterring factor for the development of a productive protection program where chemicals are involved.

The following should be considered for preventing the development of dermatitis when epoxy resins and hardeners are used:

1. Employees with a known history of skin sensitivity should not be assigned to this work.

2. A thin type of rubber or plastic glove (not surgical nor the heavy industrial type) should be provided and be required to be worn when the epoxy resin and hardener or catalyst are handled.

3. A most detailed and meticulous glove-washing and personal hygiene program should be developed and maintained at all times through continuous foreman supervision. The plant nurse or the individual in charge of first aid can be of help with this program.

4. The area on a bench or table where the epoxy resin and catalyst are mixed, should be kept clean at all times. This may be done by using stainless steel lipped trays, provided with paper inserts for easy periodic disposal. Uncontrolled spillage on work areas, gloves, spatulas or dropping small brushes on the work top area, are the usual sources of skin contamination. Immediate scrubbing with a solvent, suggested by the producer of the resin and catalyst, and the following use of warm water and soap will materially aid in providing a practical preventive program.

5. Small brushes which may be necessary in applying the mixed epoxy resin and catalyst should be provided with a metal or heavy cardboard washer on the brush handle. This will prevent the fluid mixture from draining down the handle and contaminating hands and fingers, if unprotected.

6. Operator indoctrination previous to starting this type of work, plus continuous supervision, should be the keystone of this program. The use of isocyanates presents a more serious complication. The original trouble possibly developed when the synthetic sponge rubber industry was developed both abroad and in this country. This has now spread to many other industries, particularly the electrical and bonding industries.

Aside from the potentiality of dermatitis similar to that experienced when epoxy resins and catalysts are used, the use of isocyanates releases a gas during the mixing cycle which has an irritating effect on the mucous membrane of the nose, eyes and throat. The following should be considered when isocyanates are to be used:

1. A strict pre-placement medical check should eliminate any personnel who have had a history of sinus, bronchitis, asthma or any upper respiratory infections. At times this may be difficult to determine, due to lan-

guage problems and the prospective employee reluctance to tell the truth about these deficiencies.

2. The weighing out and final mixing of the resins and isocyanates should at all times be performed within an adequately exhausted enclosure similar to a hood in a chemical laboratory. Depending upon the quantity of chemicals handled it may be necessary to provide supplied-air masks or respirators.

3. Adequate enclosures and mechanical exhaust are also necessary when the mixtures are used for final setting either for foam rubber stock, potting or other filling-type requirements.

4. Items 5 to 6 inclusive under the previous section on epoxy resins will also apply when isocyanates are used.

### Benzol and Carbon Tetrachloride

These extremely dangerous and insidious chemicals should receive special study by management and supervisors to determine if they are absolutely necessary for any production or cleaning use. They may be characterized as the most dangerous chemicals used in industry today.

Benzol is both a fire hazard and toxic. The vapors will flash at 12 deg. Toxicity is related primarily to the inhalation of the vapor. The accumulative effect is to destroy the action of the blood-forming mechanism, producing an a-plastic anemia, which may cause death. Extensive experience in the tire, rubber cement and shoe industry created a condition where this solvent was eliminated from formulations. However, it is still used in many solvent and cement formulations.

## TABLE I—PROPERTIES OF REPRESENTATIVE CHEMICALS

| Material | Flash Point, °F. | Explosive Limits | | Suitable Fire Extinguishing Agents* | Vapor Density |
|---|---|---|---|---|---|
| | | Lower | Upper | | |
| Acetone | 0 | 2.15 | 13 | 3 | 2.0 |
| Acetylene | Gas | 2.5 | 80 | 4 | 0.91 |
| Amyl acetate | 76 | 1.1 | 7.45 | 3 | 0.879 |
| Benzene (benzol) | 12 | 1.4 | ‖ | 2, 3 | 2.77 |
| Carbon disulphide | —22 | 1.0 | 50 | 1, 3 | 2.64 |
| Cellosolve | 104 | 2.6 | 15.7 | 3 | 3.10 |
| Chloroform | Non-flammable | — | — | — | 4.13 |
| Diethyl ether | —40 | 1.7 | 48 | 3 | 2.55 |
| Ethyl acetate | 24 | 2.18 | 11.5 | 3 | 3.04 |
| Ethyl alcohol | 55 | 3.28 | 19 | 3 | 1.59 |
| Gasoline | —50 | 1.3 | 6 | 2, 3 | 3-4 |
| Hexane-150 | <—20 | 1 | 7 | 2, 3 | 3.0 |
| Kerosene | 110 | 1.16 | 6 | 2, 3 | 4.5 |
| Methyl alcohol (methanol) | 54 | 6 | 36.5 | 3 | 1.11 |
| Methyl ethyl ketone | 30 | 1.8 | 11.5 | 3 | 2.48 |
| Mineral spirits | 85 | 0.77 | — | 2, 3 | 3.90 |
| Naphtha (Stoddard solvent) | 100 | 1.1 | 6.0 | 2, 3 | — |
| Naphtha—V. M. & P. | 20 | 0.92 | 6.0 | 2, 3 | 3.75 |
| Petroleum Naphtha (Benzine) | —50 | 1.4 | 5.9 | 2, 3 | 2.50 |
| Propyl alcohol | 53 | 2.5 | 12 | 3 | 2.07 |
| Styrene | 90 | 1.6 | 6.1 | 2, 3 | 3.60 |
| Toluene (Toluol) | 40 | 1.27 | 7.0 | 2, 3 | 3.14 |
| Varnoline | 100 | — | — | 2, 3 | — |
| Xylene (xylol) | 63 | 1 | 6 | 2, 3 | 3.66 |

* 1. water; 2. foam; 3. carbon dioxide or dry chemical.

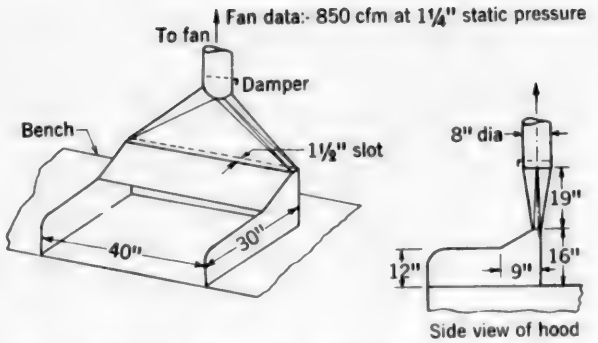



**Fig. 1. Proposed single unit exhaust for solvent cleaning operation. Courtesy, Mutual Liability Insurance Co., Engineering Department, Industrial Hygiene Division.**

The liquid may also be absorbed through the skin, causing the usual dermatitis problem. Skin absorption adds to the potential effect on the blood system. Carbon tetrachloride, the vapors of which are not flammable, is used extensively in fire extinguishment equipment but primarily as a cleaning solvent for electrical and other types of equipment. Inhalation has a serious effect on the liver and kidneys and has resulted in fatalities. Alcoholics seem to be more susceptible to liver damage due to the inhalation of the vapors of carbon tetrachloride.

One of the most prolific and dangerous uses of carbon tetrachloride is for cleaning electrical equipment by personnel in the electrical maintenance departments. The first step is to provide substitute cleaning solvents, and although their cleaning and evaporation properties may not be as good as carbon tetrachloride, they are much safer.

The second step is to provide a mechanically exhausted cleaning station as illustrated in Fig. 1. This is a most effective control mechanism and should be used for any type of cleaning solvent. The cleaning area indicated is typical for most installations. Larger or smaller units will require more or less air flow. The air flow across the unit, from the operator to the rear hood, will purge the area of highly evaporative solvent and discharge it to the outdoors.

The hood illustrated in Fig. 1 is constructed of 22 gage metal and the piping, 24 gage. General notes on this design are:

1. Provide a draw-band at the fan inlet.
2. Properly ground hood, piping, fan and motor unit.
3. Fan discharges to the outdoors.
4. Fans handling flammable vapor-air mixtures should be provided with wheels of non-sparking material.
5. Provide V-belt drice for the fan unit.

Industrial gloves should be utilized during any solvent cleaning operations as the solvent is a fat solvent and will soon defat the skin of the essential protective oils of the skin. The result will be a dry skin, ready for infection or for the outset of a severe dermatitis.

Under some operating conditions, such as on shipboard or in motor-generator rooms of power plants, carbon tetrachloride is sprayed through the electrical equipment to loosen greasy accumulations in rotor and field windings. When this is found necessary, operators should be provided with and use supplied-air masks.

Fig. 2. Series of containers that are used to protect personnel against unnecessary inhalation of toxic vapors. Some solvents are serious health hazards and some are fire hazards. Courtesy, The Protectoseal Company.

Auxiliary portable ventilation equipment should be mandatory with discharge of the poisonous vapors to the outdoors or from within ship areas and all unauthorized personnel should be removed from the areas where this solvent is used. At times it may be necessary to provide safety belts and life lines when personnel are required to enter small inaccessible areas for cleaning equipment.

There are many good and much safer solvents available for cleaning purposes than benzol and carbon tetrachloride. As a means of eliminating unnecessary expense and lost time with tedious experiments, it is recommended that technical representatives of some of the large solvent producers and distributors be requested to study the individual solvent requirements. Their recommendations and a quantity for test purposes will soon determine the results of their analysis.

The use of small quantities of any type of solvent, dispensed from a bottle, beaker or open metal container such as a one pound coffee can, should not be dismissed as an innocuous exposure. Some of the most serious results have developed from low or moderate exposures to vapors of benzol and carbon tetrachloride, over a long period of time. Conversely, some serious case fatalities have resulted from a single intense exposure even for a moderate exposure period.

Under most plant operating requirements, solvents need not be used from any open container. Figure 2 illustrates a series of containers which may be utilized to protect personnel against unnecessary inhalation. The important consideration is to provide as small a container as is consistent with work requirements. It may be desirable to fill a one pint container once or twice a day instead of having a 5 gal. container in the area.

Solvents of all types should be treated with respect. Personnel should be taught the reason for the use of a particular solvent. *All* solvents are dermatitis producers. Some solvents are extreme fire and explosion hazards. Some are serious health hazards and some are both fire and health hazards. The particular properties of any solvent used in a plant should be carefully checked through contact with the supplier, producer, fire or compensation insurance carrier, or state regulatory units.

Ignorance or calculated risks are no protection against safety and health exposures which may result in a fatality.

Indoctrination and continuous supervision are necessary, considering the ever-increasing number of chemicals used in industry at present.

## Fire and Explosion Hazards

A discussion covering the use of chemicals in industry would not be complete without mentioning the serious potentiality of fire and explosion hazards. In general, practically all chemicals in general use, except the chlorinated chemicals and some others used for special purposes, have a varying degree of fire hazard.

Table I presents a list of chemicals which may be in daily use. Such important items as flash point, lower and upper explosion limits, vapor density relative to air and the type of extinguishment recommended should be of value. Similar data relative to special chemicals, or an amplification of those listed, may be obtained from agencies mentioned in this presentation.

The most important thought to be stressed at this time is to apply the information presented as a means toward safeguarding personnel and the plant against unnecessary, costly and destructive conflagrations.

The development of a flash fire or an explosion must first satisfy the following three conditions:

1. The presence of a flammable vapor.
2. The presence of air to support the combustion.
3. A source of ignition.

There is always some flammable vapor present. The vapor concentration, usually expressed as per cent by volume in a vapor-air mixture, may be a lean mixture, or below the lower explosion limit. A source of ignition will not ignite the mixture. This may be compared to a lean mixture of air and gasoline vapor in an automobile engine.

Too rich a mixture, or one above the upper explosion limit, will not propagate a flame.

Air, of course, is usually always present. Therefore, two of the previously-mentioned conditions have been satisfied.

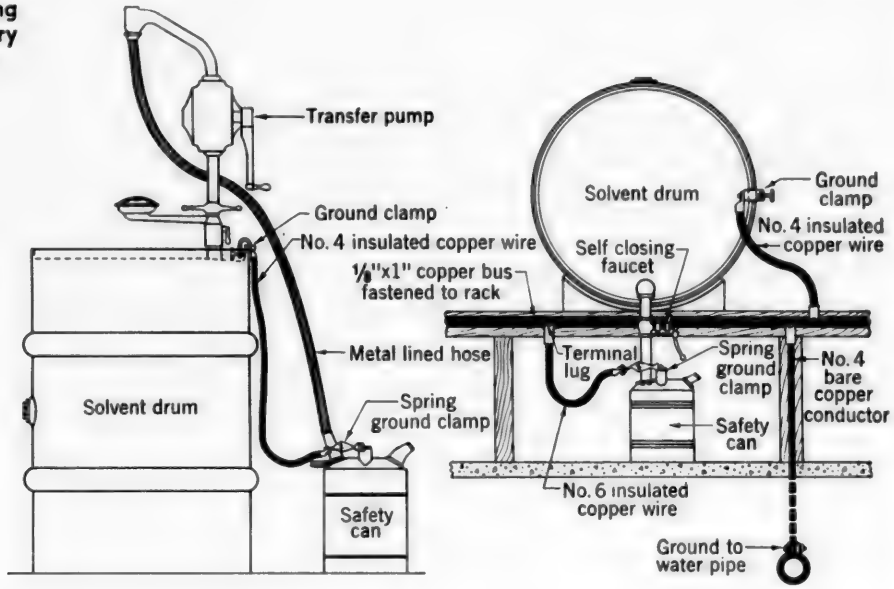
The third condition, a source of ignition, may result from spontaneous combustion; a spark from an unsuspected source of static accumulation; a spark which may be generated when a steel tool drops to a concrete floor; a spark which may be generated by an operator scuffing his shoes across a concrete floor — the shoes being provided with steel toe or heel plates; open gas flames; operation of an adjacent oil burner; electrical short circuits, and a host of many other sources. Once a fire or explosion has occurred, the only explanation which may usually be advanced is, "It never happened previously — conditions have always been the same."

### Grounding Drum

Drum stock of any type of flammable should preferably be stored at least 50 ft from any plant area. A noncombustible enclosure may be provided, but if stored in the open, the top should be weather-protected against the direct rays of the sun. The entire area should be enclosed by a fence and kept locked to prevent entrance by unauthorized personnel.

Drums in daily use should be carefully grounded in accordance with the details shown in Fig. 3. The safety container being filled should also be grounded. When flammable chemicals flow from one container to another, static electricity is generated. This cannot be prevented, but its accumulation may be controlled by proper grounding procedures. Some very disastrous industrial fires have developed during the transfer of flammable chemicals.

Fig. 3. A method for grounding solvent drums. Courtesy of Factory Mutual Engineering Division.




If the main drum stock must of necessity be kept within the plant, then the storage area should be a fire resistant vault, built in accordance with the specific requirements of the fire insurance carrier or the local fire department. Approval should be obtained previous to any construction.

Smoking should be prohibited in any area and for a large area adjacent to it, where flammable stocks are stored or used. A breach of this requirement should be sufficient cause for dismissal.

Explosion-proof lights (not vapor-tight units, since these refer to areas where steam or water-vapor may be present, such as outdoor areas) and electrical equipment including switches, should be provided for Class I, Group *C* and *D* installations in accordance with Section 500 of the National Electric Code. The ultimate responsibility for protecting plant personnel against exposure to toxic and flammable chemicals should rest with top management. Staff aid should be a coordinated objective of the purchasing agent, plant superintendent, plant engineer or maintenance foreman and the personnel manager who may usually be responsible for employee health and safety.

For a floor plan of the exhibit space at the 14th International Heating and Air-Conditioning Exposition at Convention Hall, Philadelphia, Pa., January 26 to 29, and a list of exhibitors and the items that they will display, see pages 101 to 107.

# Maintenance of Centrifugal Pumps

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**Part 3 of a three-part article discusses the maintenance of shafts, shaft sleeves, bearings and the reassembly of pump rotors. Part 1, in the November issue, covered the frequency of overhaul, and the dismantling of a centrifugal pump. Part 2, December issue, included the subjects of casings, impellers and wearing rings.**

EXCEPT for small pumps built without shaft sleeves, it is unusual to replace the shaft of a centrifugal pump. Naturally, there are casualties resulting from damage due to failure of some other part and a new shaft must be obtained or the old one repaired. Generally it is expected that the shaft will last as long as the pump.

If a pump is dismantled for overhaul, it is advisable to examine the shaft carefully for any sign of wear or irregularities. It should be first checked at all the important fits, such as at the impeller hub bores, under the shaft sleeves and at the bearings. In some cases the shaft may have been damaged by rusting or pitting because of leakage under the impellers or under the shaft sleeves. When the pump is fitted with ball bearings, the shaft may have become damaged by turning in the inner race. When babbitt bearings are used, the shaft may have worn in the journals or may have grooved. The shaft fit at the coupling may have become loose from some cause. Small pumps with shafts not provided with sleeves may show wear at the stuffing boxes.

Another important point to be examined on a shaft is the condition of the keyways. Twisting of the shaft, excessive thermal stresses, corrosion or even a poor original fit may loosen the impellers on the shaft and if the situation is not corrected, it will aggravate rapidly. Finally, a shaft should be examined carefully for possible fatigue cracks, although these cracks are a rather rare occurrence.

The shaft should next be placed in centers and checked for concentricity. It is not advisable to correct a bent or distorted shaft, as the process is an extremely difficult one even in a shop equipped to carry out the necessary procedure. Nor is it advisable to weld a shaft which has been damaged as distortion will result inevitably. Any shaft which is either bent or distorted should be replaced with a new shaft.

If the replacement cost of a new shaft is high and if facilities for repairing the existing shaft are available, it may be possible in some cases to repair the old shaft by metal spraying and remachining. Such repairs should always be carried out with the knowledge of the shaft material and of appropriate metal spraying methods. After a shaft has been repaired, it must be checked for possible distortion and rechecked once fore after complete assembly of the rotor to assure that the shaft nuts have not been tightened excessively and the shaft distorted.

Mention was made that a steel shaft might, after service, become rusted due to leakage between the shaft and the impeller or sleeves. This leakage may be even taking place through the hub of the impeller if the casting is porous at that point. Such leakage is hard to control. Leakage through the metal to metal joint of a sleeve and the hub of the impeller is often controlled by the use of packing. Often this seepage or leakage which corrodes the shaft may warrant the use of corrosion resisting material in place of regular steel. For example, monel shafts are very often used for pumps handling sea water even though shaft sleeves provide the shaft full protection against direct liquid contact.

### Shaft Sleeves Wear Most

The shaft sleeves are, for most applications, the parts of a pump most seriously subject to wear and most frequently requiring replacement. After the sleeves have been worn appreciably, it becomes impossible to adjust the packing to prevent excessive leakage. Excessively worn sleeves will frequently tear and score new packing as soon as it has been inserted. Thus, sleeves will frequently require repair or replacement when no other pump overhaul is necessary.

Generally sleeves of single stage, and the lower head multi-stage pumps can be removed from their shafts quite easily. The long sleeves sometimes used in high pressure multi-stage pumps may be harder to remove and many pumps of that type have sleeves with external grooves so that a sleeve puller can be used. See Fig. 1. If an impeller nut is provided between the sleeve and the impeller, a tight sleeve can often be backed off slightly and loosened by backing off this impeller nut. Usually a worn sleeve is replaced and is not reconditioned. Although it can be hammered to expand or to crack it, if that is necessary, care should be exercised to prevent damaging the shaft.

Shaft sleeves are sometimes reconditioned by welding or metal spraying and final grinding. Such a procedure is not recommended for pumps operating in severe service or unless existing facilities for the final grinding are adequate. Not only is it necessary to assure concentricity of grinding, but also the perpendicularity of the sleeve radial faces with the sleeve bores. The concentricity should be checked again after reassembly on the rotor.

While it is probably easier to pack a pump with brand new shaft sleeves, it is not absolutely necessary to replace the sleeves each time new packing is installed. The de-

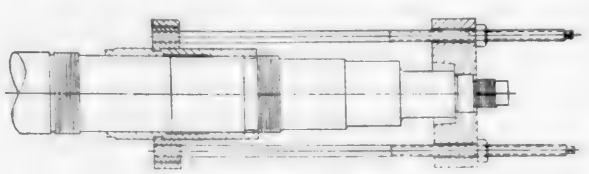


Fig. 1. Sleeve puller.

gree of wear through grooving which is permissible depends on the type of grooving which shows up. Generally, the sleeve surface is highly polished under the action of the packing and the grooving is of an undulating type rather than composed of sharp separate grooves under each individual packing ring.

### Grinding Sleeves

Depending upon certain conditions, a slight amount of grinding down or worn shaft sleeves is permissible to restore smooth surfaces and to reduce maintenance costs by re-using sleeves if the pump service is not too severe. The controlling factor is the availability of the necessary tools and shop facilities as well as trained shop personnel. It is absolutely essential that the restored sleeves present a good smooth surface and that the refinished parts have neither run-out nor distortion. If these facilities are available, it may be advisable to at least try re-grinding and re-using one set of worn sleeves to establish the practicability of this procedure.

It is necessary to avoid reducing the outside diameter of the shaft sleeves OD to a point where there will be an excessive clearance at the bottom of the stuffing box, as this would permit a certain amount of packing to be squeezed into the pump interior when the glands are tightened. As a guide, it is suggested that the sleeves not be ground down more than 25 to 30 thousandths on

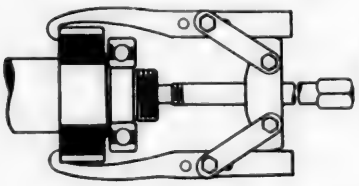


**Fig. 2. A puller can be used to remove a ball bearing from the shaft.**

the diameter. The sleeves should be ground to 16 microinch finish.

### Bearing Maintenance

A lubrication check of grease lubricated ball bearings every three months is ample. Generally, it is recommended that the bearing housing should be not more than one-third full of grease. Because an excess of grease will result in more harm to the bearing then insufficient grease, no operator should be allowed to add grease to the ball bearings of a centrifugal pump unless he is properly trained to this task.

A convenient and practical method to add grease to the bearings is to remove the drain plug from the bottom of the bearing housing, then with the pump running, add a small amount of grease or, if it is desired to renew the grease completely, add grease until the new grease can be seen at the drain outlet. Allow the excess grease in the housing to leak from the drain orifice for about ten to fifteen minutes, by which time the grease will be approaching operating temperature and the excess will have stopped flowing. Then replace the drain plug.

### How to Clean Ball Bearings

To clean ball bearings without removing them from the pumps, the following method may be used:

1. Wipe the bearing housing and remove the grease fitting and the drain plug.

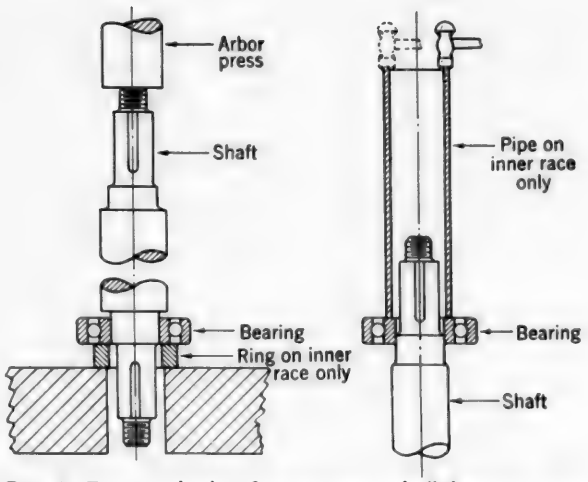



**Fig. 3. Two methods of mounting a ball bearing on a shaft.**

2. Clean the openings of hardened grease with a screw driver or similar tool.
3. Inject some solvent, such as carbon tetrachloride, into the bearing housing while the pump is running. As the grease thins out, it will run out through the drain opening. Add solvent until it runs clear.
4. Flush out the solvent with a light oil.
5. Add new grease. Replace drain plug and grease fitting.

In lubricating anti-friction bearings, a No. 1 or No. 2 grease is generally satisfactory for operation at ordinary temperature. A lighter grease should be used at high speeds or low ambient temperatures. It is recommended that mineral greases with a soda soap base be used. Greases made from animal or vegetable oils are not recommended because they can deteriorate and become acid. Most leading oil companies have special bearing greases which are quite satisfactory. For specific recommendations, consult a reputable grease manufacturer.

The maximum desirable operating temperatures for anti-friction bearings will differ from unit to unit. Continuously rising bearing temperatures or an abrupt temperature rise are indicative of trouble. These symptoms require immediate stopping of the unit and a thorough investigation to determine the cause.

When ball bearings are oil lubricated, the bearing housing is provided with an oil level gage. The level of oil in the housing should be kept as close as practicable to the high mark on the gage and under no circumstances be permitted to fall below the low mark.

Generally, ball bearings are shrunk on the shaft and a pulling device should be used to remove them. See Fig 2. The pulling jaws or fingers should be located behind the shoulder of the inner face or its adjacent sleeve. When other parts on a shaft do not interfere, the bearing may be supported by a split ring and the shaft pressed out. It may prove to be necessary to expand the inner race slightly by warming it.

### Cleaning the Bearing and Housing

When an overhaul period offers the opportunity, the bearing and the housing should be completely cleaned out in the following manner:

1. Remove the bearing from the shaft. Use a brush and

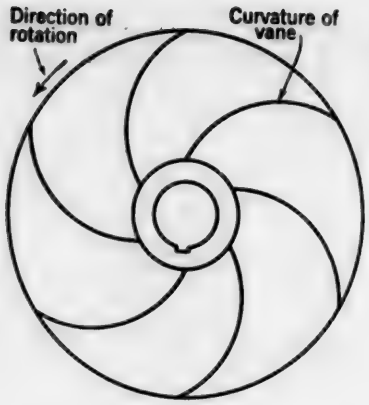



Fig. 4. Direction of rotation of centrifugal pump impeller.

wash out the housing with hot 110-125 deg F kerosene or solvent. Before adding grease, be sure to flush out the housing with a light mineral oil to prevent rust.

2. The bearing is more difficult to clean. Soak it in kerosene or petroleum solvent long enough to dissolve or soften the grease. With badly oxidized greases it may become necessary to heat the solvent or kerosene. When grease is dissolved, rotate the bearing slowly and work with a brush to dissolve chips or solid particles. When clean, immediately dip and spin the bearing in light oil to completely remove the solvent or kerosene.

### Mounting a Bearing

When remounting ball bearings on the pump shaft, remember that the satisfactory operation of antifriction bearings requires that the inner race be firmly on the shaft so that it cannot turn relative to the shaft. It is also important that the fit of the outer race prevent its rotation in the housing.

There are two methods in general use for mounting a bearing on a pump shaft:

1. Heating the bearing to expand the inner race and shrinking it on the shaft.
2. Forcing the bearing onto the shaft.

The first method is the safer. The bearing should be heated in an oil bath or electric oven to a uniform temperature of 200-250 deg and then quickly mounted on the shaft, tapping the inner race slightly with a pipe if necessary.

If the second method is used, the force may be applied by an arbor press, see Fig. 3, or by hammer blows. If an arbor press is available, a tubular sleeve, a ring, or small blocks of equal thickness are applied so that the force is directed to the inner race. With proper care, it is possible to drive a bearing on a shaft by hammering alternately on opposite sides of a tubular sleeve held against the inner race. In forcing a bearing on a shaft, care must be exercised to see that the race is never cocked at any time. The position of the bearing on the shaft should be checked by a feeler gage to make sure it is pressing firmly again the shaft shoulder.

If the pump is fitted with babbitted sleeve bearings, the clearance between the shaft and the bearing bushings should not be allowed to exceed 150% of the original clearance. Although babbitt bearings are sometimes restored by metal spraying, they are usually rebabbitted by pouring, using an undersize shaft for the core and then boring to size to minimize scraping. Care should be taken in restoring the oil grooving in the proper location so as to permit proper bearing lubrication.

Kingsbury type thrust bearings should be reconditioned with great care, following the manufacturer's instructions. In most cases, it is the safest practice to replace worn parts from the stock of spares.

### Rotor Reassembly

When remounting impellers on the pump shaft, it is essential to locate them in such a manner that they will be rotating in the proper direction. Remember that impellers always revolve away from the curvature of their vanes, as illustrated in Fig. 4.

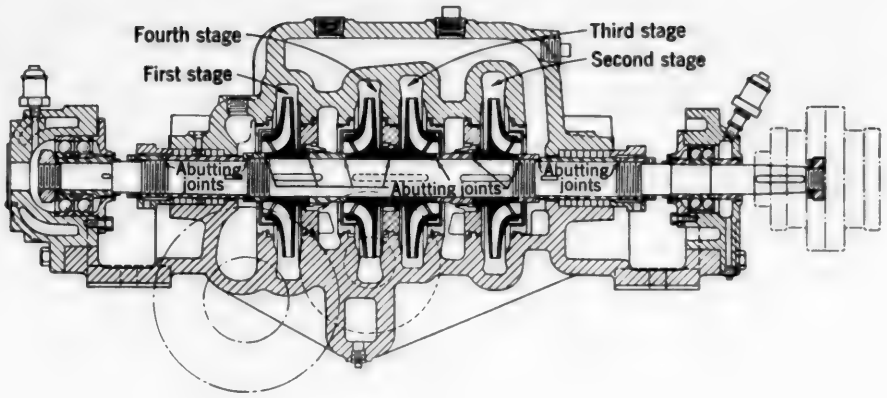
Special care is required in the reassembly of multistage axially split casing pump rotors. Such casings are made from castings and, when the pump is built, it is sometimes necessary to favor variations in longitudinal dimensions on the casings. This is done by making assembly floor adjustments to the rotor, in order to preserve the designed lateral clearances and to place the individual impellers in their correct positions with respect to their volutes or diffusers. When making field renewals of rotors or of stationary parts, all lateral distances should be compared with those on the old parts and where lateral end movement is affected, these distances should be duplicated. The assembled rotor and stationary parts (such as casing wearing rings, stage pieces and diffusers), should be placed in the lower half of the casing and the total lateral clearance checked. When the thrust bearing is assembled and the shaft is consequently in the proper position, this total clearance should be suitably divided and the impellers centrally located in their volutes or diffusers. Final adjustment may be carried out by the manipulation of the shaft nuts.

In order to avoid shaft distortion, it is extremely important that all abutting joints, as marked in Fig. 5, should be square with the shaft axis and with each other, and that the impeller and shaft sleeve nuts should not be tightened with excessive force. Otherwise, there will be a tendency to crush the metal at these joints, exerting severe moments on the shaft. The latter may become bowed under the influence of these moments and develop a marked vibration, to say nothing of the possibility of rubbing and binding at the internal running joints. When using locking screws of the safety type, the assembly should be checked using a dial test indicator to make sure that the shaft is not bent in the process. If possible, after assembly, support the rotor in its bearings or on centers to check for concentricity and correct if any eccentricity is found.

### Reassembly of the Pump

If the pump casing is split axially, great care must be exercised in replacing the upper casing half and tightening up the casing bolts. If more than one row of bolting is used, the row nearest to the pump central axis should be tightened up first. After all the bolts have been tightened once, they should be gone over once again to insure the tightness of the casing joint. They should then be tightened once more when the pump has been brought up to operating temperature.

Fig. 5. Assemby of a 4-stage rotor.




### Packing Maintenance

The following procedure should be followed in repacking a stuffing box:

1. Remove all old packing and clean the stuffing box. The use of a packing puller is most convenient.
2. Make sure the packing to be used is of suitable type for the prevailing temperature and pressure conditions.
3. Insert each ring separately, pushing it as far into the stuffing box as possible and seating it firmly. Stagger successive rings so that the joints are 90 or 180 deg apart.
4. If a water seal cage is used, make sure that it is located directly under the sealing liquid connection and that the insertion of successive rings will not displace it.
5. After the required number of packing rings have been inserted, install gland, and tighten gland nuts firmly; then back off the nuts until gland is loose. In tightening the gland, the bolts should be brought up uniformly so that the gland will not be cocked and so that the packing is subjected to a uniform pressure.

It is customary to start the pump with the stuffing box glands quite loose and water from the pump flowing freely along the shaft. The stuffing box gland should then be gradually tightened until the leakage almost stops but not to the point when there is no leakage. If the stuffing box is tightened too much the leakage is stopped completely, the packing will expand from the heat and burn and score the shaft sleeves.

The question frequently comes up as to the wisdom of adding one or two rings of new packing to the old packing. Such procedure is dependent upon the type of packing involved and should not be attempted by personnel not sufficiently skilled in packing maintenance. It is generally recommended that the old packing be replaced completely.

### Coupling Lubrication

All-metal flexible couplings require lubrication. When such couplings are used, recommendations for lubricating the couplings will be found in the coupling manufacturer's instructions which are generally incorporated with the pump manufacturer's instruction book.

It is highly important to check couplings periodically to insure that the proper amount of lubricant is maintained at all times.

### Record of Inspection and Repairs

The working schedule of the semi-annual and annual inspection program should be incorporated on maintenance cards, with a separate card issued for each of the pumps in the installation. These cards should contain, in addition to the identifying pump number and the date of the scheduled inspection, a complete record of all the items requiring individual inspection. It should also contain space for comments and observations of the inspecting personnel. Adequate maintenance does not stop with repair work on worn or damaged parts. A written record of the conditions of the parts to be repaired or replaced, of the rate and appearance of the wear and of the method by which the repair was carried out is as important as the repair job itself. Such records can form the basis of preventive measures which will act to reduce both the frequency and cost of maintenance work. The type and extent of detail of inspection records varies with the type of pump in question and availability of personnel. A typical example of the record which can be kept of the wearing ring clearances of a multistage pump is shown in Figs. 6 and 7.

In many cases, it is advisable to take photographs of badly worn parts before they are repaired, as such photographs provide a more accurate and more graphic record of the damage than a mere description.

In all cases, complete records of the cost of maintenance and repairs should be kept for each individual pump, together with a record of its operating hours, so that study of these records may reveal whether a change in materials or even a minor change in design may not be the most economical course of action.

### Spare and Repair Parts

The service in which a centrifugal pump is used will determine, to a great extent, the minimum number of spare parts which should be carried in stock at the site of the installation. The minimum for any centrifugal pump should include a set of wearing rings, a set of shaft sleeves (or a shaft if no sleeves are used) and a set of bearings. In many cases, it is advisable to carry a complete spare rotor which can be installed in the pump when examination shows that the pump rotor has become excessively worn or if it becomes accidentally damaged. Of course, in all cases, sufficient stock or spare packing for the stuffing boxes and material for the gasket of axially split casing pumps should be on hand.

It is recommended, as an insurance against delays, that

spare parts be purchased at the time the order for the complete unit is placed. Depending upon the contemplated method for wearing ring overhaul, the spare wearing rings are ordered either of the same size as the wearing rings used in the assembly of new pump or bored undersize.

When ordering spare and replacement parts after the pump has been received in the field, the pump serial number and size as stamped on the manufacturer's nameplate should always be given. This information is essential in order that the manufacturer may identify the pump and furnish repairs parts of correct size and materials. Most centrifugal pumps are of standard design and a great number of combinations are made for each size of casing, using different impeller sizes and designs. Lacking an identification number, the pump manufacturer would be at a loss to furnish correct repairs even though the size and type of the pump might be known.

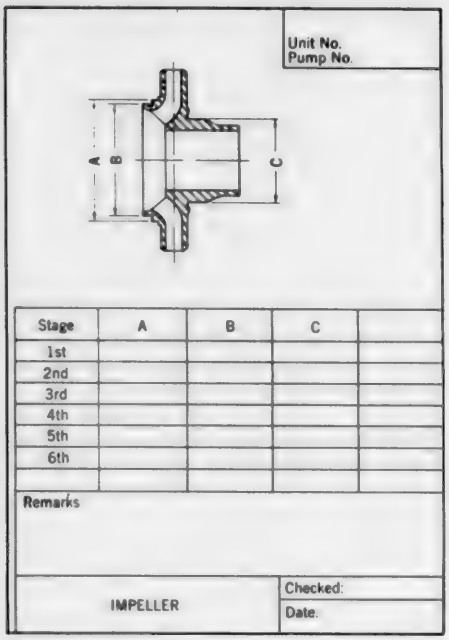



Fig. 6 (left). Record card for impeller dimensions.

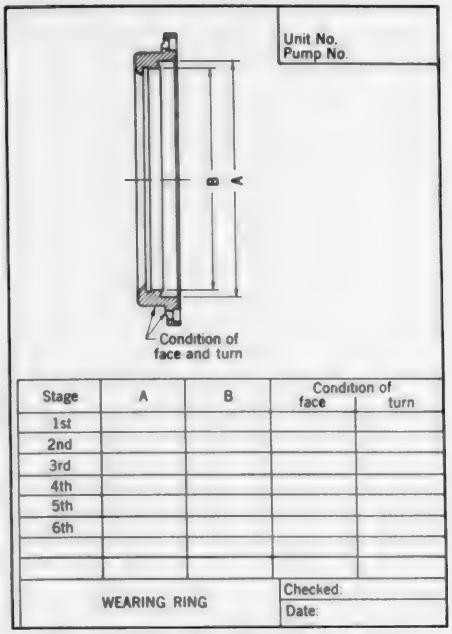



Fig. 7 (right). Record card for wearing ring dimensions.

## Waste Gas May Provide Fuel for England

Plans are in the process of development which would utilize natural gas that at present is being burned off in waste flares in Venezuelan and Middle East oil fields, so that such waste gas may help solve some of the present fuel problems in England.

A converted oil tanker will be used to ship the liquefied natural gas to England.

An estimate has been made that 30 billion cubic meters of natural gas are wasted annually in Venezuela and the Middle East. This is an amount that is equal to the entire yearly gas production of Europe, except for the Soviet Union. If this gas waste can be shipped in liquefied form to England in three 20,000-ton tankers, making 15 round trips a year, it would be enough to meet half of England's total requirements.

The British Gas Council and Constock Liquid Methane Corp., a company owned jointly by Continental Oil and Union Stockyards of Chicago, are running the trial shipments from undisclosed ports in the Caribbean and the Gulf of Mexico.

A plant for storing and regasifying the imported liquefied gas is being built at Canvey Island near London. If all goes well, Constock plans to market large quantities of the liquefied natural gas at various areas of the world where there is a shortage of reasonably priced fuels.

The gas industry has long realized the storage saving potential is the fact that when natural gas is liquefied, it occupies only one six-hundredth of the space it requires in the normal state. Methods of liquefying natural gas by refrigeration has been known for nearly 40 years, but it has not been until recently that scientists in the United States and in the Soviet Union have solved the storage safety problem through studies in low temperature metallurgy.

The Soviet Union is safely operating a 2 million cubic meter liquefaction and storage installation for natural gas in the Moscow area, it was revealed earlier this year in International Energy Reports. This installation was really conceived, designed and built by American industry and financed by the now defunct lend-lease program in 1947. Stacey Brothers, a division of Dresser Industries, in Dallas, delivered most of the parts for the $6,000,000 plant in Moscow, for assembly by Russian technicians. The termination of lend-lease ended work on the project in this country, but the major portion of the plant had been delivered and the missing items could be easily duplicated.

Liquefied natural gas was originally developed in the United States as a method of storage to meet peak load requirements. East Ohio Gas Company constructed the first commercial liquefaction storage and regasification plant in Cleveland in 1940, but after four years of successful operation, an explosion demolished every building on the company's 14-acre site. This concluded until the present time, this method of storage in this country.

LOUIS BLENDERMANN ON

# PIPING AND PLUMBING

## Janitors' Closets

ONE of the important rooms in every major building is the janitor's closet. In fact, this room is included at each floor of commercial, institutional or multi-story buildings, whether they are large or small. If the building is large enough in area, two or more such closets may be included at each floor level. In other types of buildings, the facilities of a janitor's closet may be located at the ground floor level or basement of the building.

The prime purpose of the janitor's closet is to house the waste sink and implements used by the cleaning staff for cleaning and waxing the floor. The waste sink is, of course, the important factor in this space. Various types of water and waste facilities may be used to fulfill the needs of the cleaning staff.

### Office Building

An office building is a good building example for showing the details of a typical janitor's closet. One such location would be similar to that shown in Fig. 1, although some floors may have more than one janitor's closet.

The decision regarding the location of the janitor's closet is always the responsibility of the architect. Sometimes the closet is placed near the rest rooms; other times, it is placed in a location that is thought more suitable. A janitor's closet does not necessarily have to be placed near waste and water facilities that serve the rest rooms since it, quite often, is economical to provide separate waste and water risers for the sinks. In any event, this is a matter that must be discussed with the architect during the design stages.

### Typical Janitor's Closet

A typical janitor's closet is illustrated in Fig. 2. Sufficient space has been provided for the cleaning implements and for free access to the particular waste sink. The door should be large enough to permit passage of the mop cart into the space for this cart usually contains pails of water used in cleaning and specific cleaning implements. The dirty water is emptied into the sink and the pails refilled with fresh water. Mops are washed and wrung out in the sink. In general, this space should be large enough to allow a person complete freedom in performing these necessary tasks. The architect must decide just how much space can be devoted to this closet. With careful thought, a janitor's closet can be a compact room with shelves, or cabinets provided to contain all the cleaning implement in a neat orderly way.

### Riser Diagram

A riser diagram of a typical arrangement of waste sinks in an office building is given in Fig. 3. For this 15-story

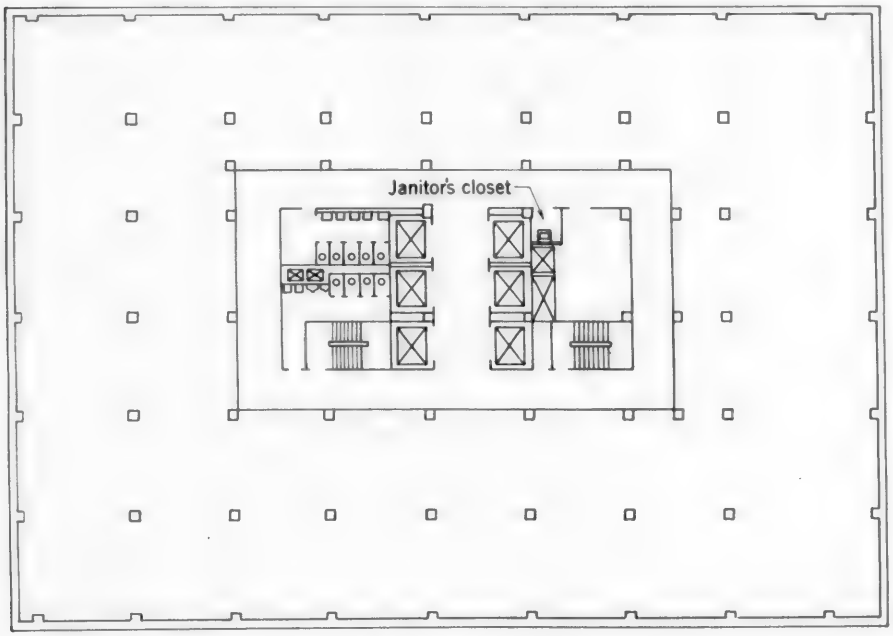


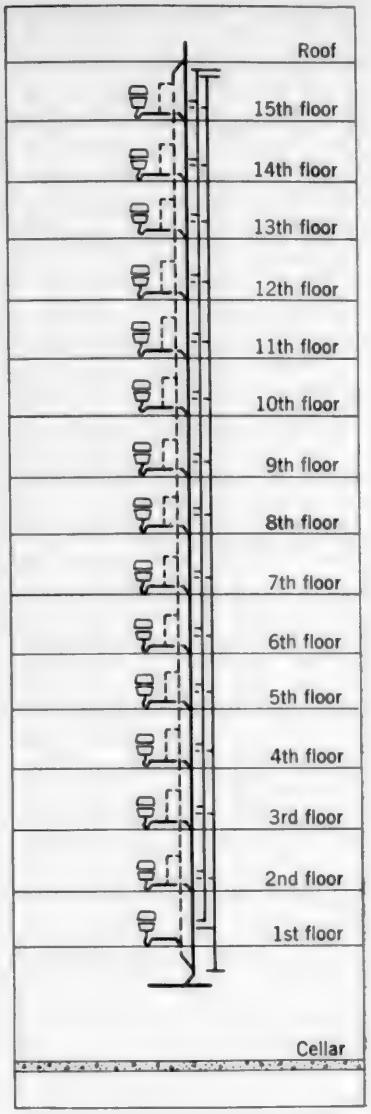

Fig. 1. Location of janitor's closet in relation to the floor area in an office building.

office building, the waste and water facilities consist of a waste stack, vent stack, cold and hot water risers. Since the building is so tall, we have shown the cold and hot water to be downfeed systems, with the cold and hot water distribution mains located at or in the ceiling of the fifteenth floor in the building. The cold water terminates at the lowest fixture in the building while the hot water continues on and connects with the hot water circulating main which lo located in the basement or cellar of the building.

Although the symbol used in the riser diagram is for a service sink, one should note that a mop sink or receptor sink can be used with equal success. Water valves and other control devices were not shown in the riser diagram but they must be included and placed in the most favorable positions to ensure adequate control of the water distribution systems.

Pressure reducing valves must be installed on these cold and hot water branches to the waste sinks where the water pressure will exceed the prescribed limit. Water hammer arrestors should be placed in the water distribution system to absorb the hydrostatic shock of water hammer; balancing valves are required at the base of the hot water riser to permit the balancing of the flow in the hot water distribution system, thereby avoiding any possibility of short circuiting the distribution of water in the hot water system. Likewise, expansion devices should be placed in the hot water risers where necessary to limit the scope of pipe movement.

**Fig. 3. Riser diagram of the water, waste and vent facilities in an office building.**




### Service Sink

The first type of waste sink to be discussed is the service sink illustrated in Fig. 4.

There are many different types of service sinks that may be used for this purpose. Moreover, they are available in a number of materials which include Vitreous china, cast iron enamel and stainless steel.

We shall assume that cast iron enamel sinks are used. The cast iron enamel sink is usually placed against the wall in the janitor's closet and is secured in place by means of a bracket as shown. There are a number of brackets that may be used for this purpose. They range from the type that are anchored to the wall or backed up by steel plates, to the type that are supported by carrier uprights free of the wall construction. The engineer must decide just which means of support he feels is most suitable.

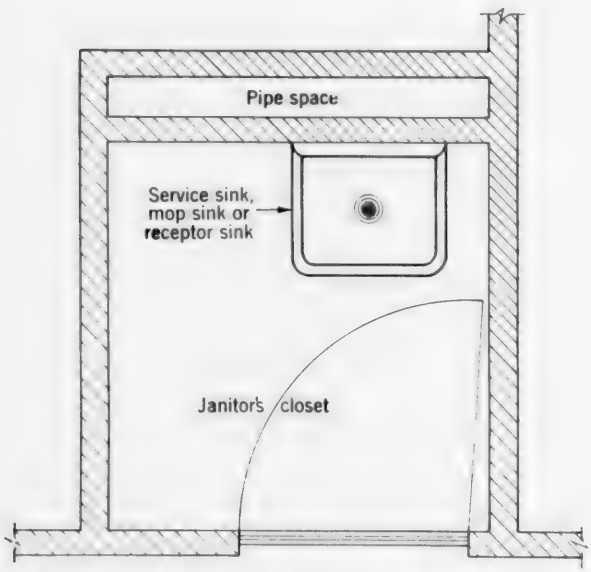



**Fig. 2. Space that could be provided to fulfill the needs of a janitor's closet.**

The service sink is also supported on a P-trap standard as shown in the detail. The P-trap standard engages the sink strainer that is placed in the sink and when the sink strainer is tightened in place, it compresses a rubber gasket that is placed between the sink and the flange of the trap standard to provide a watertight connection.

The base of the trap standard includes an adjustable nipple and a floor flange. If desired, the floor flange can be secured to the floor slab. The strap standard is also furnished with a cleanout plug to offer access in the event that a stoppage must be cleared.

If the service sink is to be installed at a lower floor level in the building, an S-trap can be used as indicated by a detail of Fig. 4. The S-trap standard connects with the underground drainage piping. Although it has not been shown, a regular P-trap can be used with the service

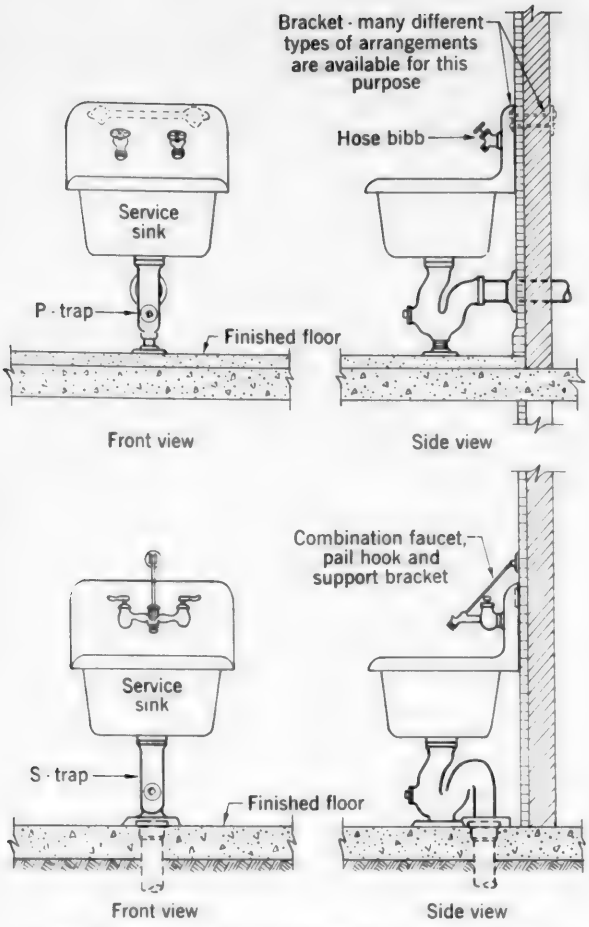



**Fig. 4. Different arrangements for a service sink.**

sink but it is important if this trap is used that the service sink is adequately supported on exposed brackets that are connected to concealed carrier uprights. All of the traps can be equipped with a tapped side connection that will accommodate an overflow pipe from the service sink when it is used.

For dispensing water at the service sink, a number of different arrangements can be utilized. Two such basic arrangements have been shown in Fig. 4. The first uses ordinary hose bibbs and the second has a combination faucet, pail hook and support bracket of which there are several types. The combination faucet will allow a pail to be hung on the faucet while it is being filled.

The combination faucet used for the example is equipped, in this case, with a vacuum breaker to prevent back siphonage. Siphonic action is caused by a drop of pressure in the water distribution system and sometimes by other reasons. The vacuum breaker is an important device and should always be included with a fixture of this type since rubber hoses are frequently attached to the hose bibbs or the combination faucet, and because the rubber hose is often submerged by the water in the fixture, the potential hazard for siphonic action will exist.

Rim guards of brass or stainless steel are available and can be snapped on the rim of the sink to prevent shipping the enamel finish with the pails. The service sink serves its purpose for the janitor's closet in a very adequate manner.

## Mop Sink

The mop sink is a waste sink that sets on the floor in a janitor's close and therefore does not require any means of support. This type of fixture is shown in Fig. 5.

The mop sink is a very popular fixture and, like the service sink, is used in a good many installations. The mop sink is furnished in either cast iron enamel or galvanized cast iron. The mop sink sets on the rough floor slab in the janitor's closet. If a floor finish is applied, it is added around the sink as shown in the detail.

The mop sink is equipped with a basket strainer that will intercept and retain any debris or mop lint that may be contained in the dirty wash water that is dumped into this sink. A secondary strainer can also be placed in the bottom of the sink when it is desired. The waste piping is caulked in place at the caulking hub provided at the bottom of the sink. Caulking is done after the sink is set in place.

If a watertight slab is to be included in the janitor's closet where the mop sink is to be placed, the fixture can then be equipped with a flange and clamping collar to accommodate the membrane or flashing that is used. This specific arrangement is also shown in Fig. 5.

Water can be dispensed by a number of different arrangements. The methods shown, for example, include a combination faucet, and a pail hook and support bracket. The pail hook holds the pail while it is being

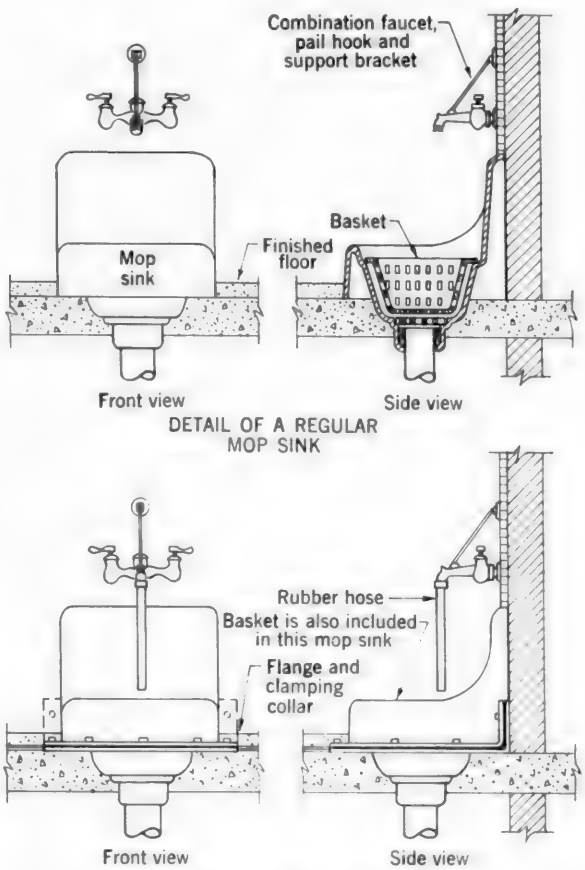



**Fig. 5. Mop sink installation in a janitor's closet.**

filled with water. A rubber hose, often included as shown in the detail, is of advantage in filling a pail on the mop cart without the need of lifting the pail off the cart. The combination faucets are equipped with vacuum breakers to prevent the danger of the siphonic action when a longer rubber hose is used that can be submerged in the pail.

The back of the mop sink has a wide ledge so that tile can be extended down around the back of the fixture to conceal the flange and clamping collar at the back of the fixture. This particular point was not detailed on the drawing for the sake of clarity in showing the clamping arrangement. Rim guards may be used with the cast iron enamel mop sinks but are not required for the galvanized cast iron mop sinks.

The mop sink is a very practical unit to install in a janitor's closet and it has an advantage in that it simplifies the handling of pails and the cleaning of mops.

### Receptor Sink

The receptor sink can also be used as a waste sink. The typical manner in which this fixture can be used is detailed in Fig. 6. The receptor sink is also set on the rough floor slab in the janitor's closet. If finish is to be applied, it can be added around the sink as shown. Many materials are used in the construction of the receptor sink including concrete and terrazzo.

Several types of drain connections might be provided. The method shown utilizes a floor drain connected to the waste piping and then incorporated with the floor slab when it is poured. The strainer shank is added after the receptor is set in position. Mastic compound is applied to the underside of the trainer to afford a leakproof connection when the strainer is secured to the drain for the sink.

If a watertight slab is contemplated for the janitor's closet then a clamping collar can be furnished for the drain to secure the membrane or flashing to the drain. The engineer may detail other methods of drain connection between the receptor and the drainage piping that he may favor.

A combination faucet, pail hook and support bracket is shown, although again, other water dispensing arrangements can be used. A rubber hose has been included to simplify the task of filling the pails. A vacuum breaker is included with the faucet to prevent siphonic action.

Rim guards may be fitted on the receptor sink to protect it from the chipping that may result when pails are banged against it. An advantage of the receptor sink is that it is close to the floor and makes the cleaning and filling of the pails an easy chore. A disadvantage of the receptor sink is that it is easily cracked due to the rough handling of pails.

In Figs. 4, 5 and 6, waste connections to the waste stack, and vent piping are not shown. In every case roughing should comply with the local code.

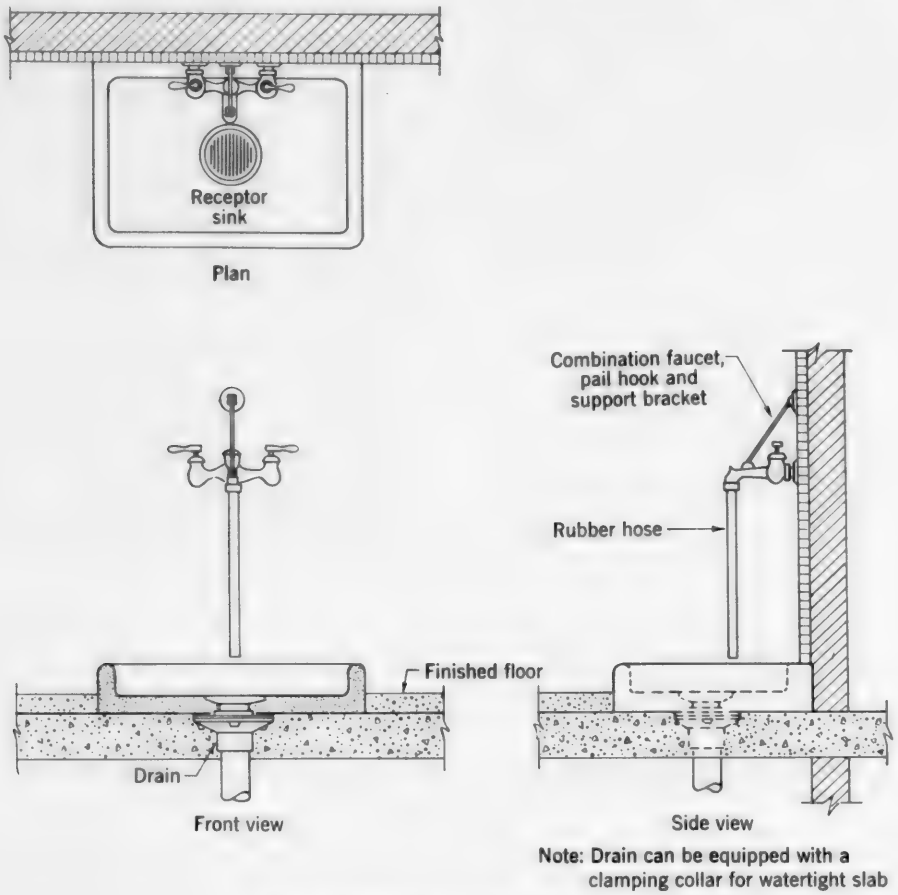



**Fig. 6. Installation of a receptor type sink.**

# 14th Heating and Air Conditioning Show and 65th ASHAE Meeting to be Held in Philadelphia

WHAT is believed to be the largest heating and air conditioning exposition will be held in Convention Hall, Philadelphia, Pa., January 26 to 29, in conjunction with the 65th annual meeting of the American Society of Heating and Air Conditioning Engineers with headquarters at the Bellevue-Stratford, January 26 to 29.

The convention program consists of seven technical sessions which includes the following three symposiums: Hydronics; Heat Pump Performance; Corrosion and Water Treatment. The technical part of the program follows:

## MONDAY—January 26

9:00 a.m. First Session
- Researches on Heating and Ventilation in Relation to Human Comfort, by Thomas Bedford
- Metabolic Patterns in Stressful Environments, by Nello Pace, M. D.
- Re-evaluation of the Comfort Chart, by B. H. Jennings

## TUESDAY—January 27

9:30 a.m. Second Session
- Supply Outlet Locations for Basement Heating, by J. R. Wright and D. R. Bahnfleth
- Pulsations in Single-port Gas-fired Residential Heating Equipment, by C. F. Speich and A. A. Putnam
- Low Frequency Combustion Noise in Oil-Burning Equipment, by G. J. Sanders and W. E. Lawrie
- Omni-directional Low-speed Hot-wire Anemometer, by J. F. Kemp (by title only)

9:30 a.m. Third Session
- Symposium on Hydronics

## WEDNESDAY—January 28

9:30 a.m. Fourth Session
- Frost Formation and Heat Transfer on a Cylinder Surface in Humid Air Cross Flow, Parts I and II, by P. M. Chung and A. B. Algren
- Downward Heat Transfer Through a Joist Space, by P. M. Chung and C. E. Lund (by title only)
- Annual Energy Use for Electric Space Heating, by R. L. Boyd
- Heating by Hypocaust, by E. Daisley Thatcher

9:30 a.m. Fifth Session
- Symposium on Heat Pump Performance

2:00 p.m. Sixth Session
- Probe for Thermal Conductivity Measurement of Dry and Moist Materials, by W. Woodside
- Heat Gain Through Windows Shaded by Metal Awnings, by Necati Ozisik and L. F. Schutrum
- A New Method for Calculating Radiant Exchanges, by Benjamin Gebhart

2:00 p.m. Seventh Session
- Symposium on Corrosion and Water Treatment

1083 **A-P Controls Div., Controls of America, Milwaukee, Wis.**

C-34 **Acme Engineering & Mfg. Corp., Muskogee, Okla.**
Roof ventilators, fans, and automatic shutters.

508 **Acme Industries, Inc., Jackson, Mich.**
Packaged water chillers; cooling towers; central station air handlers.

409 **Acme Mfg. Co., Philadelphia, Pa.**

921 **Addison Products Co., Addison, Mich.**
Residential central air conditioners; heat pumps.

S-22 **Adelta Mfg. Co., Inc., Philadelphia, Pa.**
Pipe, duct and fittings for residential heating and cooling installations.

S-66 **Aerofin Corp., Syracuse, N. Y.**

625 **Aeroquip Corp., Jackson, Mich.**
Self-sealing couplings; flexible hose lines.

29 **Air & Refrigeration Corp., New York, N. Y.**
Factory-insulated weatherproof panels.

C-59 **Air Conditioning Equipment Corp., New York, N. Y.**
Mechanical Btu meter.

415 **Air Conditioning, Heating & Ventilating, 93 Worth St., New York, N. Y.**
417
419
Publications and technical books.

4 **Air Conditioning & Refrigeration News, Detroit, Mich.**

S-95 **Air Con Filter Corp., Memphis, Tenn.**

56 **Air Control Products, Inc., Coopersville, Mich.**
Registers, grilles and diffusers.

C-44 **Air Controls, Inc., Div., The Cleveland Heater Co., Cleveland, Ohio.**

533 **Air Devices, Inc., New York, N. Y.**
535 Diffusers, registers, and grilles; high-velocity mixing boxes.

118 **Air Distribution Products, Los Angeles, Calif.**
122
Diffusers and volume control grilles and registers.

643 **Airfloor Company of California, Inc., Santa Fe Springs, Calif.**
Unit ventilator.

S-48 **Air Guide Plastics Corp., Miami, Fla.**

C-16 **Air-Maze Corp., Cleveland, Ohio.**
Electrostatic precipitators; dry-type filter panels.

S-93 **Airserco Mfg. Co., Inc., Pittsburgh, Pa.**

1082 **Airtemp Div., Chrysler Corp., Dayton, Ohio.**

C-109 **Airtex Corp., Chicago, Ill.**
Radiant-acoustical ceiling unit.

434 **Alco Valve Co., St. Louis, Mo.**
Thermo expansion valves, refrigerant distributors, solenoid valves, pressure regulators, reversing valves for heat pump and hot gas defrost.

433 **Aldrich Co., Wyoming, Ill.**
435 Boiler-burner units.

214 **Allen-Bradley Co., Milwaukee, Wis.**

1108 **Allis-Chalmers Mfg. Co., Milwaukee, Wis.**
Pumps, motors, control and V-belt drive equipment.

917 **Allis Co., The Louis, Milwaukee, Wis.**

C-115 **Ameri Vent Div., American Metal Products Co., Inc., Los Angeles, Calif.**
Gas vent pipe and fittings for gas-fired boilers, furnaces, and space and water heaters.

113 **American Air Filter Co., Louisville,**
117 **Ky.**

44 **American Blower Div., American-**
46 **Standard, Detroit, Mich.**
48 Refrigeration machine, air conditioners, fans, Gyrol fluid drive, unit heaters and power roof ventilator.

C-39 **American Coolair Corp., Jacksonville, Fla.**
Roof ventilators and condensing system.

C-21 **American Furnace Co., St. Louis, Mo.**
Warm air furnaces; air conditioning units.

805 **American Gilsonite Co., Salt Lake City, Utah.**

717 **American Iron and Steel Inst., Com-**
719 **mittee on Steel Pipe Research, New York, N. Y.**
Steel pipe applications.

1016 **American Society of Heating & Air-conditioning Eng., New York, N. Y.**

69 **American Standard, Air Conditioning Div., New York, N. Y.**
Evaporators and condensers; residential heating system.

62 **American - Standard, Plumbing &**
64 **Heating Div., Pittsburgh, Pa.**
66
68

45 **American Warming & Ventilating Co., Toledo, Ohio.**
Air control equipment.

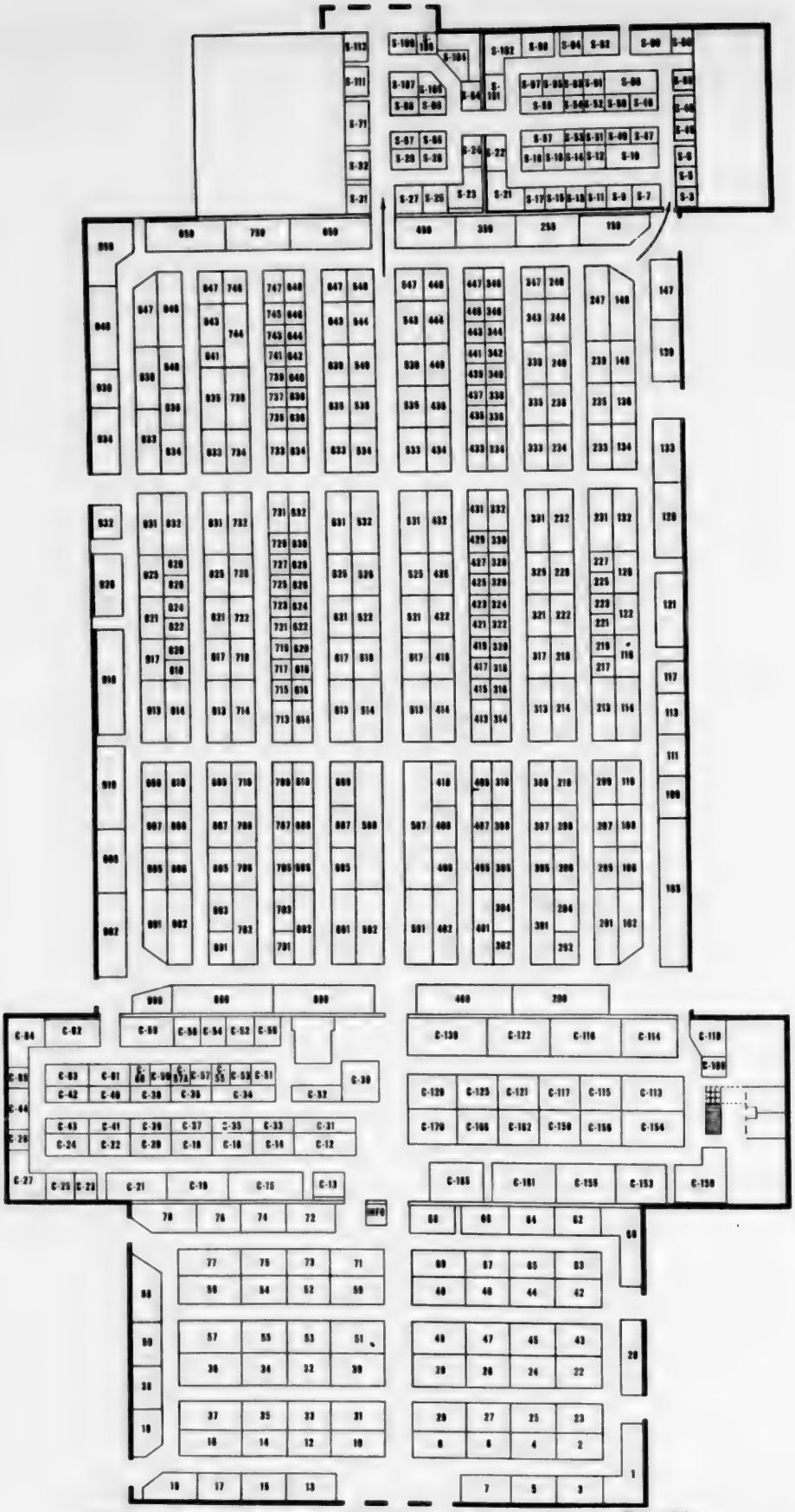
C-13 **Ammerman Co., Inc., Minneapolis, Minn.**
Power roof ventilator; plastic skylights.

616 **Anderson Co., Div., The V. D., International Basic Economy Corp., Cleveland, Ohio.**
Separators and purifiers for steam, air and gas.

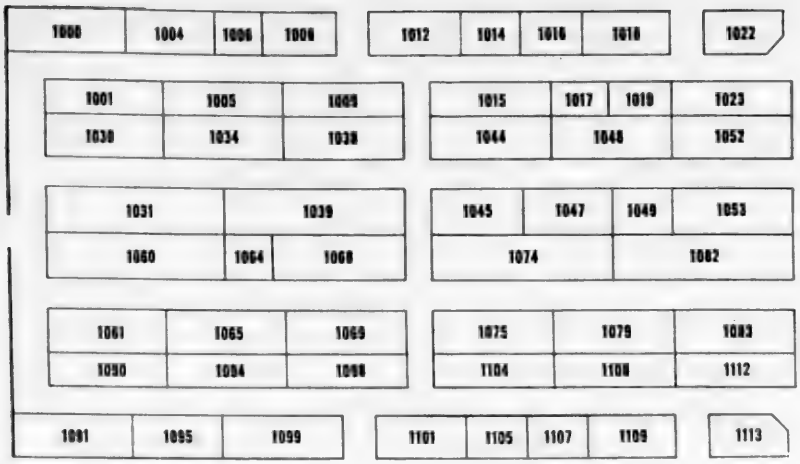
602 **Anemostat Corp. of America, New York, N. Y.**
Air diffusers; high velocity school units.

C-19 **Ansul Chemical Co., Marinette, Wis.**
Dispensing manifold for packaged refrigerants, sight glass, refrigeration drier, refrigeration oil, and packaged refrigerants.

C-113 **Arkla Air Conditioning Corp.,**



Floor plan, 14th International Heating and Air-Conditioning Exposition.




**Floor plan of Convention Hall, Philadelphia, Pa.**

**Little Rock, Ark.**
Steam operated and gas-fired water chillers, gas regulators and gas light.

73 **Arkion Mfg. Co., Cleveland, Ohio.**
Atomizing humidifier.

425 **Armstrong Cork Co., Lancaster, Pa.**
427 Pipe insulations; corkboard; related products.

1 **Armstrong Furnace Co. Div., National**
3 **Union Electric Corp., Columbus, Ohio.**
Gas and oilfired furnaces, air conditioners, and gas and oil burners.

610 **Armstrong Machine Works, Three Rivers, Mich.**
Traps, strainers, humidifiers and zone valves for hot water heating systems.

22 **Arnco Steel Corp., Middletown, Ohio.**

S-12 **Arno Adhesive Tapes, Inc., Michigan City, Ind.**
Duct and insulation tape.

C-41 **Arrow-Hart & Hegeman Electric Co., The, Hartford, Conn.**

S-94 **Ascot Gas Water Heaters, Ltd., Cleveland, Ohio.**

C-51 **Associated Mills, Inc., Chicago, Ill.**

741 **Atlantic Pipe Bending & Fabricating Corp., Moonachie, N. J.**

407 **Auer Register Co., The, Cleveland, Ohio.**
Registers and grilles.

609 **Air-Temp Co., Div., Heat-Timer Corp., New York, N. Y.**

5 **Auto-Flo Corp., Detroit, Mich.**
Humidifiers, fuel oil filters and evaporator plates.

731 **Automatic Devices Co., The, Western Springs, Ill.**

406 **B-I-F Industries, Inc., Providence, R. I.**

628 **Bacharach Industrial Instrument Co., Pittsburgh, Pa.**
Combustion testing kit; filter gage; air velocity meter.

S-15 **Baker, Inc., C. I., Lorain, Ohio.**
Deaerating vacuum return receiver and pump.

1069 **Baltimore Aircoil Co., Inc., Baltimore, Md.**
Flexible-capacity cooling tower.

118 **Barber-Colman Co., Rockford, Ill.**
122 Controls and control centers; double duct mixing box.

C-150 **Barber Mfg. Co., The, Cleveland, Ohio.**

C-55 **Barke Products, Inc., Bay Village, Ohio.**
Steel pulleys and V-belts.

15 **Barnebey - Cheney Co., Columbus, Ohio.**
Air purification equipment based on activated charcoal.

305 **Barry Blower Co., Minneapolis, Minn.**
Belted ventilating sets; steel plate exhausters; fan wheels.

232 **Baso Inc., Milwaukee, Wis.**
Self energized gas firing systems, and magentic valves.

626 **Bastian-Morley Co., Inc., La Porte, Ind.**

621 **Bayley Blower Co., Milwaukee, Wis.**
Centrifugal fans, air washers and blast coils.

134 **Bell & Gossett Co., Morton Grove,**
136. **Ill.**
Refrigeration compressors; full-size hydronic system.

C-58 **Bendix-Westinghouse, Evansville Ind.**
Motor compressors; commercial condensing units.

35 **Binks Mfg. Co., Chicago, Ill.**
Cooling towers.

C-53 **Blankin Equipment Corp., Philadelphia, Pa.**

343 **Boiler Engineering & Supply Co., Inc., Phoenixville, Pa.**
Boilers for hot water, high temperature water.

308 **Brookside Corp., McCordsville, Ind.**
Fan blades; centrifugal blowers.

431 **Brown Products Corp., Union, N. J.**
Baseboard radiation; residential boilers; water chillers.

C-110 **Browning Mfg. Co., Maysville, Ky.**
Chain and belt drives, beating units and couplings.

331 **Brundage Co., The, Kalamazoo, Mich.**
Centrifugal blowers.

54 **Buensod-Stacey, Incorporated, New York, N. Y.**
Dual duct mixing units; specialties.

4 **Business Publishing Co., Detroit, Mich.**

507 **Buffalo Forge Co., Buffalo, N. Y.**
Air conditioning cabinet, centrifugal ventilating fan, and make-up air unit.

406 **Builders - Providence, Inc., Providence, R. I.**

721 **Burgess-Manning Co., Chicago, Ill.**
Ceiling radiant panel for heating and cooling.

514 **Burnham Corp., Irvington, N. Y.**
518 Oil and gas-fired heating equipment,
522 and air conditioning equipment.

S-47 **Cady, P. L., Darien Center, N. Y.**

306 **Calgon Co. Div., Hagan Chemicals & Controls, Inc., Pittsburgh, Pa.**
Chemical treatments for scale and algae; hand and machine cleaners; gas leak detector.

C-12 **Cambridge Filter Corp., Syracuse, N. Y.**
Various types of filters.

745 **Carey Mfg. Co., The Philip, Cincinnati, Ohio.**

247 **Carnes Corp., Verona, Wis.**
Power roof ventilators; diffusers, registers and grilles.

C-153 **Carrier Corp., Syracuse, N. Y.**
C-155 Absorption refrigeration, roto-
C-161 spray, air conditioning system compressor, condensing unit and water chillers.

843 **Cash Valve Mfg. Corp., A. W., Decatur, Ill.**
Valves, regulators and strainers.

S-32 **Century Fan & Ventilator Co., Inc., Stamford, Conn.**

326 **Chace Company, Detroit, Mich.**

647 **Champion Blower & Forge Co., Lancaster, Pa.**
Fans and vent sets.

1094 **Chattanooga Royal Co., Chattanooga,, Tenn.**
Central gas-fired furnaces, residential air conditioning units, and heaters.

C-33 **Chemical Solvent Co., Birmingham, Ala.**
Cleaners and chemicals.

1001 **Chicago Blower Corp., Franklin**
1030 **Park, Ill.**

1039 **Chicago Pump Co., Chicago, Ill.**
Pumps for a variety of applications, pneumatic and tankless water supply systems, sealed electrode floatless pump controller, and automatic alternator for duplex sets of pumps.

S-71 **Chicago Steel Furnace Co., Chicago, Ill.**

C-40 **Chicago Ventilator Co., Inc., Chicago, Ill.**
Ventilators; chimney caps and louvers.

S-101 **Choldun Mfg. Corp., New Haven, Conn.**

534 **Clarage Fan Co., Kalamazoo, Mich.**
536 Industrial and exhaust type fans, and air conditioning unit.

C-121 **Cleaver-Brooks Co., Milwaukee,**
C-125 **Wis.**

735 **Cobra Metal Hose Div., D. K. Mfg. Co., Chicago,, Ill.**
Connectors and vibration absorbers.

13 **Coleman Co., Inc., The, Wichita, Kan.**
Gas and oil-fired furnaces; air conditioning units; water heater; air distribution system.

408 **Columbia Boiler Co. of Pottstown, Pottstown, Pa.**
Packaged boilers; oil burner; baseboard radiation.

348 **Columbia Burner Co., Toledo, Ohio.**

140 **Combustion Control Div., Electronics, Corp. of America, Cambridge, Mass.**

932 **Commercial Filters Corp., Melrose, Mass.**
Oil, water, and compressed air filters.

248 **Condensation Engineering Corp., Chicago, Ill.**
Prefabricated Class "A" chimneys; open-hearth prefabricated fireplace.

346 **Congress Drives Div., Tenn Corp., Detroit, Mich.**

631 **Connor Engineering Corp., Danbury, Conn.**

933 **Continental Air Filters, Inc., Louisville, Ky.**
Air filter.

418 **Cook Co., Loren, Berea, Ohio.**
Roof and wall ventilators.

C-122 **Coolerator Div., McGraw-Edison Co., Albion, Mich.**

C-166 **Copeland Refrigeration Corp., Sid-**
C-170 **ney, Ohio.**
Motor-compressors.

833 **Corbman Bros., Philadelphia, Pa.**
Prefabricated duct and fittings.

38 **Crane Company, Chicago, Ill.**
58
59

S-13 **Crown Engineering Corp., Keyport, N. J.**
Oil burner ignition components.

C-50 **Crown Home Equipment Co., Philadelphia, Pa.**
Boiler-burner units; warm air furnace; baseboard radiation.

802 **Curtis Mfg. Co., St. Louis, Mo.**
Packaged liquid chiller; packaged air conditioners.

332 **Cutler - Hammer, Inc., Milwaukee, Wis.**

1075 **DeBothezat Fans Div., American Machine & Metals, Inc., East Moline, Ill.**
Induced draft fans; roof ventilators.

539 **Delavan Mfg. Co., West Des Moines, Iowa.**
Nozzles for oil burners and air conditioning applications, strainers, filters, adapters, and servicemen's kits.

S-10 **Delco Products Div., General Motors Corp., Dayton, Ohio.**

42 **Detroit Controls Div., American-**
307 **Standard, Detroit, Mich.**
Expansion valves, thermostats and controls for air conditioning systems.

217 **DeZurick Corp., Sartell, Minn.**
Valves.

640 **Diamond Expansion Bolt Co., Inc., Garwood, N. J.**

126 **Diehl Mfg. Co., Somerville, N. J.**

320 **Dielectric Products Co., Inc., Jersey City, N. J.**

C-63 **Dodge Corp., F. W., New York, N. Y.**

931 **Doerr Electric Corp., Cedarburg, Wis.**

318 **Dongan Electric Mfg. Co., Detroit, Mich.**

S-105 **Dornback Furnace & Foundry Co., Cleveland, Ohio.**
Gas-fired warm air furnaces and washable air filters.

C-28 **Downing Steel Products Co., Dayton, Ohio.**
Gas conversion burner.

121 **Dravo Corporation, Pittsburgh, Pa.**
Industrial space heater.

600 **Drayer-Hanson Div., U. S. Radiator Corp., Los Angeles, Calif.**

C-32 **Dryer Electric Corp., Brooklyn, N. Y.**
Axial-type fan.

S-50 **Dryomatic Corp., Alexandria, Va.**

650 **Dunham-Bush, Inc., West Hartford,**
750 **Conn.**
850 Cooling-heating conditioner, large
950 remote control units, condensers, and packaged chiller

1004 **du Pont de Nemours & Co., E. I., Wilmington, Del.**

205 **Durant Insulated Pipe Co., Inc., East Palo Alto, Calif.**
Insulated pipe conduit.

C-35 **Dura-Vent Corp., Redwood City, Calif.**

432 **Duro-Dyne Corp., Farmingdale, N. Y.**
Air hammer; damper hardware; insulation adhesive.

202 **Dwyer Mfg. Co., F. W., Michigan City, Ind.**
Gages, combustion test kit, air velocity meter, pressure switch, and flowmeters.

445 **Eagan Co., Inc., Walter H., Philadelphia, Pa.**

147 **Econo Products Co., Inc., East Haddam, Conn.**

221 **Eddington Metal Specialty Co.,**
223 **Eddington, Pa.**

C-154 **Edwards Engineering Corp., Pompton Plains, N. J.**
Motorized zone control valves; baseboard radiation.

707 **Electric Boat Div., General Dynamics Corp., Groton, Conn.**

948 **Electric Furnace-Man, Inc., Emmaus, Pa.**
Residential heating equipment; commercial boiler-burner unit.

226 **Electric Heat, New York, N. Y.**

C-165 **Electro-Air Cleaner Co., Inc., McKees Rocks, Pa.**
Electronic air cleaners.

330 **Electro Dynamic Div., General Dynamics Corp., Bayonne, N. J.**

1049 **Electromode Div., Commercial Controls Corp., Rochester, N. Y.**
Fan-circulating heaters; duct heaters; baseboard heaters.

440 **Electronics Corp of America, Cambridge, Mass.**
Control systems for oil and industrial gas burners; smoke indication and alarm systems.

S-90 **Eigen Mfg. Corp., Long Island City, N. Y.**

S-106 **Ellicott Fabricators, Inc., Baltimore, Md.**
Hot water generator; heat exchanger.

1098 **Emerson Electric Mfg. Co., The, St. Louis, Mo.**

429 **Empire Chemical Products Co., Newark, N. J.**
Furnace vacuum cleaners; boiler cleaners.

C-114 **Engel Sheet Metal Equipment,**
C-116 **Inc., St. Louis, Mo.**
Sheet metal equipment.

436 **F5 Air Conditioning Corp., Tulsa, Okla.**
Air-cooled condensers and condensing units.

S-25 **Fafnir Bearing Co., The, New Britain, Conn.**

10 **Farr Company, Los Angeles, Calif.**
12 Standard panel filters; grease eliminators; automatic filters.

413 **Fasco Industries, Inc., Rochester, N. Y.**

800 **Federal Boiler Co., Inc., Midland**
900 **Park, N. J.**
Residential, commercial boilers; baseboard radiation.

314 **Fee & Mason Mfg. Co., Inc., Manasquan, N. J.**

50 **Field Control Div., H. D. Conkey & Co., Mendota, Ill.**
Domestic, commercial and industrial barometric draft controls.

1047 **Fitzgibbons Boiler Co., Inc., New York, N. Y.**
Residential and packaged boilers.

C-162 **Flanders Filters, Inc., Riverhead, N. Y.**

706 **Flexible Tubing Corp., Guilford, Conn.**

638 **Flexonics Corp., Maywood, Ill.**
Pipe expansion joints, pipe and tube expansion compensators and flexible connectors.

309 **Frick Co., Waynesboro, Pa.**
Packaged water-chiller, air conditioner, machine parts, valves, fittings, and controls.

1023 **Frigidaire Div., General Motors Corp., Dayton, Ohio.**
Gas and oil-fired residential furnaces; home and commercial air conditioners.

334 **Fulton Sylphon Div., Robert-Fulton**
336 **Controls Co., Knoxville, Tenn.**
Heating and ventilating controls; packless expansion joints.

620 **Furnas Electric Co., Batavia, Ill.**
Electric motor controls; reduced voltage starters.

C-14 **Gallaher Co., The, Omaha, Neb.**
Fiberglas power roof exhauster.

1091 **Gannon Co., Inc., The Russell R., Cincinnati, Ohio.**

613 **General Air Products Corp., Cedar Grove, N. J.**
Diffusers, registers, and grilles.

422 **General Automatic Products Corp., Baltimore, Md.**
Gas-fired boilers; baseboard radiation; deaerator tanks.

808 **General Blower Co., Morton Grove, Ill.**
Fans and blowers.

148 **General Chemical Div., Allied Chemical Corp., New York, N. Y.**
Refrigerants.

513 **General Controls Co., Glendale, Calif.**

1066 **General Electric Co., Air Conditioning Dept., Tyler, Tex.**

410 **General Filters, Inc., Novi, Mich.**
Oil filters; soot removers; warm air humidifiers.

614 **General Fittings Co., East Greenwich, R. I.**
Tankless water heaters; heating specialties.

1112 **General Heating Products Co., Philadelphia, Pa.**

324 **General Products Co., Inc., Fredericksburg, Va.**
All-fuel chimney; gas vents.

304 **Goodfellow Co., Inc., E. D., Memphis, Tenn.**
Induced draft cooling towers and centrifugal pumps.

C-24 **Goodyear Tire & Rubber Co., The, Akron, Ohio.**

43 **Gordon & Platt, Inc., Winfield, Kan.**

78 **Governair Corp., Oklahoma City, Okla.**

334 **Grayson Controls Div., Robertshaw-**
336 **Fulton Controls Co., Long Beach, Calif.**

531 **Grinnell Co., Inc., Providence, R. I.**

1109 **Gulf Oil Corp., Pittsburgh, Pa.**

547 **Gustin-Bacon Mfg. Co., Kansas City, Mo.**
Glass fiber ducts; duct insulation.

C-54 **Hammond Valve Corp., Hammond, Ind.**
Heating specialties and valves.

S-16 **Hanovia Lamp Div., Engelhard Industries, Inc., Newark, N. J.**

622 **Harris & Co., Arthur, Chicago, Ill.**

209 **Hart & Cooley Mfg. Co., Holland, Mich.**
Registers, grilles and diffusers, gas vent pipe and fittings.

1090 **Hastings Air Control, Inc., Omaha, Neb.**
Air conditioning units; burners; unit heaters; portable hoist.

S-67 **Heat Controller, Inc., Jackson, Mich.**
Electric dehumidifiers, and central air conditioners.

226 **Heating Publishers Inc., New York, N. Y.**

609 **Heat-Timer Corp., New York, N. Y.**

Zone heating valves; smoke alarms and recorders; combustion controls.

S-26 **Heil Process Equipment Corp., Cleveland, Ohio.**
Fans, fume hoods, fume washers, plastic components, and standard hoods and ducts of solid plastic.

51 **Heil-Quaker Corp., Nashville, Tenn.**
53

26 **Henry Furnace Co., The, Medina,**
28 **Ohio.**
49
Summer and winter domestic air conditioners; gas-fired unit heaters and duct furnaces; gas conversion burners.

313 **Henry Valve Co., Melrose Park, Ill.**
Valves, driers, strainers and accessories for refrigeration, air conditioning and industrial applications.

S-85 **Hermidifier Co., Neffsville, Pa.**

236 **Highside Chemicals Inc., Clifton, N. J.**
Fluid refrigerant dehydrant; liquid leak detector.

S-31 **Hilti Rapid Fastening Systems, Inc., Stamford, Conn.**

S-97 **Howell Electric Motors Co., Howell, Mich.**

24 **Huck Mfg. Co., Detroit, Mich.**
Fasteners, blind rivets and installation tools.

826 **Hydrotherm, Inc., Northvale, N. J.**
828

S-92 **I.C.E.D. Corp., St. Petersburg, Fla.**

517 **Ilg Electric Ventilating Co., Chicago,**
521 **Ill.**
Power roof ventilators; fans; gas, steam, hot water and electric unit heaters; electric wall-insert, baseboard and cabinet heaters.

111 **Illinois Engineering Co., Chicago, Ill.**

925 **Illinois Testing Laboratories, Inc., Chicago, Ill.**
Air velocity, temperature, dew point measuring instruments.

723 **Imperial Brass Mfg. Co., The, Chi-**
725 **cago, Ill.**
Tube fittings; refrigeration valves; tube tools.

S-53 **Imperial Damper Co., New York, N. Y.**
Louvers, dampers and grilles.

S-105 **Incinerator Corp. of America, Eastlake, Ohio.**

322 **Independent Blade Co. Div., Westlund Industries, East Haven, Conn.**
Heavy duty saw blades.

701 **Independent Register Co., The, Cleveland, Ohio.**

414 **Industrial Acoustics Co., Inc., New York, N. Y.**
Silencers for air handling and air conditioning systems.

55 **Industrial Combustion Inc., Milwaukee, Wis.**
Oil, gas, and combination burners.

S-58 **Industrial Plastic Fabricators, Norwood, Mass.**
PVC and fiberglass centrifugal fans; PVC air washer; model PVC exhaust system; fabricated and machined parts.

415 **Industrial Press, The, New York,**
417 **N. Y.**
419 Air Conditioning, Heating and Ventilating magazine and technical books.

201 **Ingersoll-Rand Co., New York, N. Y.**
Centrifugal pumps; motor pumps.

338 **Instro-Gas Corp., Detroit, Mich.**
Torches and furnaces; infra-red heaters.

1052 **International Heater Co., Utica, N. Y.**

835 **Iron Fireman Mfg. Co., Cleveland, Ohio.**
New series of lowboy furnaces, and commercial and industrial burners for oil, gas or dual fuel.

1006 **Jackes-Evans Mfg. Co., St. Louis, Mo.**
Two- and three-way solenoid valves.

817 **Jackson & Church, York, Pa.**
821
825
831

934 **Janitrol Heating & Air Conditioning Div., Surface Combustion Corp., Columbus, Ohio.**
School heating, ventilating, cooling system; duct furnace.

926 **Jenkins Bros., New York, N. Y.**

47 **Jenn Air Products, Co., Inc., Indian-**
**apolis, Ind.**
Roof and wall exhausters.

702 **Johns-Manville Sales Corp., New York, N. Y.**
Pipe, duct, and other type insulation.

1095 **Johnson Co., S. T., Bridgeport, Pa.**

1113 **Johnson Furnace Co., The, Cleveland, Ohio.**
Gas and oil-fired home heating and air conditioning equipment.

23 **Johnson Service Co., Milwaukee, Wis.**
25 Pneumatic temperature and air condi-
27 tioning controls including control centers.

1104 **Joy Mfg. Co., Pittsburgh, Pa.**

140 **Kaiser Co., E. B., Glenview, Ill.**
Prefabricated insulated piping.

421 **Kaustine Furnace & Tank Corp.,**
423 **Perry, N. Y.**

709 **Keeney Publishing Co., Chicago, Ill.**

113 **Kennard Corp., St. Louis, Mo.**
117

63 **Kewanee Boiler Div., American-**
65 **Standard, Kewanee, Ill.**

S-97 **Kingston Conley, Inc., North Plainfield, N. J.**

72 **Koppers Co., Inc., Baltimore, Md.**
Sound traps.

1022 **Korfund Co., Inc., The, Long Island City, N. Y.**
Flexible connectors; vibration mountings.

1016 **Koven & Brother, Inc., L. O., Jersey City, N. J.**
Oil and gas packaged units; gas and electric water heaters.

832 **Kritzer Products Div., Peerless of America, Inc., Chicago, Ill.**
Water chillers; fan coil units for heating, cooling and ventilating; grilles and controls.

C-36 **Kruger Air Conditioning Co., Tuc-**
C-38 **son, Ariz.**

S-65 **K S M Products, Inc., Merchantville, N. J.**
Capacitor discharge stud welder.

748 **L. O. F. Glass Fibers Co., Toledo, Ohio.**

1008 **Lake Chemical Co., Chicago, Ill.**

1044 **Lau Blower Co., The, Dayton, Ohio.**
Blowers and components for residential heating and air conditioning.

316 **Lawler Automatic Controls, Inc., Mount Vernon, N. Y.**
Line of thermostatic control valves and regulators.

S-11 **Lehigh Fan Div., Fuller Co., Catasauqua, Pa.**
Induced-draft fans.

635 **Lennox Industries Inc., Des Moines,**
639 **Ia.**
Heating systems for schools, office and commercial buildings; industrial-type direct-fired space heaters.

C-18 **Leslie Co., Lyndhurst, N. J.**
C-37

71 **Lewin-Mathes Co., Div. of Cerro de Pasco Corp., St. Louis, Mo.**
Copper and brass tube, pipe, and rod; miniature draw bench and coiler.

C-117 **Lima Electric Motor Co., Inc., The, Lima, Ohio.**
Electric motors; variable speed drives.

747 **Lima Register Co., Lima, Ohio.**
Registers and grilles.

233 **Lockformer Co., The, Chicago, Ill.**
Sheet metal machinery.

333 **Magnetrol, Inc., Chicago, Ill.**

648 **Maid-O'-Mist, Inc., Chicago, Ill.**
Air eliminators; humidifiers; valves.

630 **Major Controls Co., Corona, Calif.**
Pressure regulators; combination controls.

57 **Mammoth Furnace Co., The, Minne-**
**apolis, Minn.**
Floor - mounted heaters; suspended heaters.

30 **Marathon Electric Mfg. Co., Wausau, Wis.**
Various types of integral and fractional horsepower motors.

C-23 **Marco Electric Mfg. Corp., Womelsdorf, Pa.**

74 **Marley Co., The, Kansas City, Mo.**
Cooling towers.

139 **Marlo Coil Co., St. Louis, Mo.**
Air conditioning units, fan coil units, spray type dehumidifier and steam coil.

714 **Marsh Heating Equipment Co., Skokie, Ill.**

S-14 **Master-Craft Supply Co., Inc., West Haverstraw, N. Y.**
Furnace cleaners, dust bags, hose, attachments and furnace filters.

1005 **Mathes Co., Inc., The, Fort Worth,**
1009 **Tex.**

834 **Maxitrol Co., Detroit, Mich.**

540 **McDonnel & Miller, Inc., Chicago,,**
**Ill.**
Operating demonstration of new flow switch.

31 **McQuay, Inc., Minneapolis, Minn.**
33 Ventilators, unit heaters, condensers and coils.

S-53 **Mechanical Contractors Supply Co., Inc., New York, N. Y.**
Grilles; louvers; damper hardware.

S-107 **Meier Electric & Machine Co., Inc., Indianapolis, Ind.**
Axial flow fan blades; domestic electric heating.

1019 **Mercold Corp., The, Chicago, Ill.**
Switches and controls.

76 **Metalbestos Div., William Wallace Co., Belmont, Calif.**
Gas vent pipe; all-fuel chimney.

244 **Metalmaster Corp., Newark, N. J.**
Oil burners; circulating and sump pumps.

S-46 **Metal Mfg. Co., Fort Lauderdale, Fla.**

77 **Metals & Controls Corp., Attleboro, Mass.**
Motor protector thermostats and starting relays, temperature controls, circuit breakers, electrical contacts, copper cored wire, and connectors.

234 **Mid-Continent Metal Products Co., Chicago, Ill.**
Gas burners, combination gas-oil burners; burners for commercial incineration and fume removal.

624 **Miller Valve Co., Inc., Pittsburgh, Pa.**
Check valves and accessories.

1083 **Milwaukee Valve Co., Milwaukee, Wis.**

C-61 **Mine Safety Appliances Co., Pittsburgh, Pa.**
Various types of filters.

132 **Minneapolis - Honeywell Regulator**
231 **Co., Minneapolis, Minn.**
225 Thermotats and related controls for
227 residences and commercial applications, electronic air cleaners, building security system, fire alarm and detection system.

526 **Modine Mfg. Co., Racine, Wis.**
532 Steam and gas-fired unit heaters;

convector radiators; gas furnaces; room air conditioners; heating and ventilating units.

810 **Monarch Mfg. Works, Inc., Philadelphia, Pa.**
Oil burner nozzles; pressure regulating valves; strainers.

213 **Monogram Industries, Inc., Quincy, Ill.**
Oil and gas-fired furnaces, and vented, recessed gas heaters.

947 **Morrison Products, Inc., Cleveland, Ohio.**
Air moving equipment for heating and air conditioning applications.

743 **Morton Engineering Service, Paul S., Kalamazoo, Mich.**
Engineering calculators; business calculators.

102 **Mueller Climatrol Div., Worthington**
106 **Corp., Milwaukee, Wis.**
108 Humidifier, heat pump, and packaged
110 oil-fired boiler.

822 **Multi-Vent Div., The Pyle-National**
824 **Co., Chicago, Ill.**

343 **Napanee Iron Works, Ltd., Napanee, Ontario, Canada.**

400 **Nash Engineering Co., The, South Norwalk, Conn.**
Demonstration of calculating pipe sizes, control, heating and condensation pumps.

401 **National Heater Co., Inc., St. Paul, Minn.**
Space heaters; duct heaters.

600 **National-U. S. Radiator Corp., Heating and Air Conditioning Div., Johnstown, Pa.**
Heating and air conditioning products.

109 **Nelson Div., Herman, American Air Filter Co., Inc., Louisville, Ky.**

1060 **Nesbitt, Inc., John J., Philadelphia, Pa.**
Air conditioners; unit heaters; unit ventilators.

439 **New Castle Products, Inc., New Castle, Ind.**

C-130 **New York Blower Co., The, Chicago, Ill.**

1053 **Niagara Blower Co., New York, N. Y.**

1048 **Niagara Machine & Tool Works, Buffalo, N. Y.**
Small press brake; power ring and circle shears; sheet metal machines.

S-97 **Ohio Electric Mfg. .Co., Maple Heights, Ohio.**

28 **Olsen Mfg. Co., The C. A., Elyria,**
28 **Ohio.**
49
Summer and winter air conditioners; gas-fired unit heaters; gas-fired duct furnaces; gas conversion burners.

938 **Orr & Sembower, Inc., Reading, Pa.**
Boiler for forced circulation hot water heating systems; steam atomizing burners for packaged automatic boilers.

S-24 **Oster Mfg. Co., The, Wickliffe, Ohio.**

1101 **Owens - Corning Fiberglas Corp., Toledo, Ohio.**
Duct insulation products; filters.

S-3 **Pabco, Cleveland, Ohio.**

210 **Pacific Steel Boiler Div., National-U. S. Radiator Corp., Johnstown, Pa.**
Transites and photographs showing line of boilers, burners, coils, fans, convectors and finned tubes.

646 **Paragon Electric Co., Two Rivers, Wis.**

809 **Patterson-Kelley Co., Inc., The, East Stroudsburg, Pa.**

7 **Peerless of America, Inc., Chicago, Ill.**

543 **Peerless Electric Co., The, Warren, Ohio.**
Fans, blowers, roof ventilators and air handling units.

C-62 **Peerless Heater Co., The, Boyertown, Pa.**
Gas-fired boiler for installation in small space; industrial type gas-fired boilers; line of furnaces.

C-35 **Peerless Mfg. Div., Dover Corp., Louisville, Ky.**
Gas heaters and gas venting systems.

S-57 **Penn Boiler & Burner Sales, Newark, N. J.**

939 **Penn Controls, Inc., Goshen, Ind.**
Automatic controls for heating and air conditioning.

S-23 **Penn Ventilator Co., Inc., Philadelphia, Pa.**
Roof exhausters; gravity ventilators.

806 **Pennsylvania Furnace & Iron Co., Warren, Pa.**
Gas fired boilers and furnaces; gas conversion burners.

C-30 **Perfection Industries Div., Hupp Corp., Cleveland, Ohio.**
Oil and gas furnaces; air conditioners, and heat pumps.

C-57 **Perolin Co., Inc., The, New York, N. Y.**

75 **Petro, Cleveland, Ohio.**

642 **Pittsburgh Plate Glass Co., Fiber**
644 **Glass Div., Pittsburgh, Pa.**

302 **Plumbing and Heating Publishing Co., New York, N. Y.**

803 **Power-Flame Div., Inc., Siemon Mfg. Co., Grandview, Mo.**
Gas and combination burners.

727 **Power Line Fan Co. Div., Chelsea**
729 **Products, Inc., Plainfield, N. J.**

601 **Powers Regulator Co., The, Skokie, Ill.**

544 **Prox Co., Inc., Frank, Terre Haute, Ind.**

C-52 **Quality Specialty Co., Inc., Camden, N. J.**

310 **Radiant Utilities Corp., Brooklyn, N. Y.**
Oil burners; water heaters; submersible pumps.

1105 **Ramset Fastening System, Winchester-Western Div., Olin Mathieson Chemical Corp., Cleveland, Ohio.**
Powder-actuated tools; hammer-type fastening tools; sheet metal screw and adapter.

1065 **Ranco Inc., Columbus, Ohio.**
Controls, multiple circuit selector switch, and restrictor valves with capillary tubing for heat pump systems.

342 **Randall Graphite Bearings, Inc.,**
344 **Lima, Ohio.**
Pillow blocks; flange bearing assembly.

S-66 **Rawlplug Co., Inc., The, New Rochelle, N. Y.**
Masonry anchors and drills.

C-27 **Raypak Co., Inc., El Monte, Calif.**
Glass lined storage tanks and immersion heaters; gas-fired hot water boilers.

C-65 **R. C. S. Tool Corp., Bloomington, Ill.**
Flush-cutting saw and accessories.

36 **Reading Tube Corp., New York, N. Y.**

20 **Recold Corp., Los Angeles 22, Calif.**
Evaporative condenser; high-pressure air-handling unit.

733 **Redmond Co., Inc., Owosso, Mich.**
Fractional horsepower motors and blowers; rotating electrical mechanisms.

1015 **Reliance Electric and Engineering Co., Cleveland, Ohio.**

847 **Remington Arms Co., Inc., Bridgeport, Conn.**

1112 **Republic Products Co., Philadelphia, Pa.**

216 **Research Products Corp., Madison, Wis.**
Humidifier, filters and paint arresters.

801 **Revcor, Inc., Carpentersville, Ill.**
Blower wheels; propeller fans; sheet metal housings.

S-7 **Richmond Engineering Co., Richmond, Va.**

1000 **Richmond Plumbing Fixtures Div., Rheem Mfg. Co., Metuchen, N. J.**
Gas and oil-fired boilers, and line of residential warm air units.

909 **Ric-wiL, Inc., Barberton, Ohio.**
Prefabricated insulated piping systems.

722 **Ridge Tool Co., The, Elyria, Ohio.**
726 Pipe wrenches, cutters, vises, reamers, threaders, power drives, pipe and bolt threading machines, thread cutting oil, tubing cutter and screw chain vises.

613 **Rite Engineering & Mfg. Corp., Los Angeles, Calif.**

C-31 **Rittling Corp., The, Buffalo, N. Y.**
Schoolroom unit ventilator; cabinet unit heater; finned-tube radiation.

618 **Roberts - Gordon Appliance Corp., Buffalo, N. Y.**
Conversion and industrial burners, boilers, furnaces, and gas lamps.

1064 **Robertson Co., H. H., Pittsburgh, Pa.**

S-108 **Robvon Backing Ring Co., Elizabeth, N. J.**
Backing rings for welding pipe.

C-57-A **Rotherm Engineering Co., Inc., Chicago, Ill.**
Revolving and expansion joints.

C-64 **Rybolt Heater Co., The, Ashland, Ohio.**
Warm air furnace with built-in electronic air cleaner.

1012 **Sarco Co., Inc., and Sarcotherm Controls, Inc., New York, N. Y.**
Weather - compensating temperature controls for steam and hot water heating systems, steam traps, pumps, radiation, and heating specialties.

617 **Schecter Brothers Co., Philadelphia, Pa.**

19 **Schemenauer Mfg. Co., Holland, Ohio.**
Hot water and steam heating equipment.

S-17 **Schnacke, Inc., Evansville, Ind.**
Compressor and condensing unit; package liquid chillers.

235 **Scully Signal Co., Melrose, Mass.**
Gages, vent signals, controls and low water cut-off.

C-60 **Sealmaster Div., Stephen-Adams Mfg. Co., Aurora, Ill.**

S-52 **Selck & Co., Inc., Walter E., Chicago, Ill.**

340 **Senna Mfg. Co., Spokane, Wash.**

S-54 **Senrac Industries, Madison, Wis.**
Wall louvers and dampers.

325 **Shaw-Perkins Mfg. Co., Pittsburgh, Pa.**
Heat distribution equipment.

S-49 **Shenango Refractories, New Castle, Pa.**

607 **Skuttle Manufacturing Co., Milford, Mich.**
Automatic humidifiers for warm air heating systems, washable electrostatic air filters, and commercial and industrial humidifiers.

C-129 **Slant/Fin Radiator Corp., Richmond Hill, N. Y.**
Baseboard radiation; finned-tube radiation.

1074 **Smith Co., Inc., The H. B., Westfield, Mass.**

52 **Sporlan Valve Co., St. Louis, Mo.**
Thermostatic expansion valves, refrigerant distributors, solenoid valves, filter-driers, and moisture and liquid indicator.

1107 **Sprague Electric Co., North Adams, Mass.**

208 **Spraying Systems Co., Bellwood, Ill.**
Spray nozzles and accessories.

605 **Square D Co., Milwaukee, Wis.**
Distribution and motor control equipment.

609 **Standard Instrument Corp. Div., Heat Timer Corp., New York, N. Y.**

632 **Standard Stamping & Perforating Co., Chicago, Ill.**
Registers and grilles.

C-25 **Star Expansion Industries Corp.,**

**Mountainville, N. Y.**
Masonry anchors.

**441 Sta-Rite Products, Inc., Delavan, Wis.**
Centrifugal pumps for air conditioning applications.

**744 Steinen Mfg. Co., Wm., Newark, N. J.**
Industrial and residential draft controls, oil burner nozzles, electrodes, flame mirrors, adapters, and industrial spray nozzles.

**S-64 Stewart-Hall Chemical Corp., Mt. Vernon, N. Y.**
Chemical products.

**814 Stewart-Warner Corp., Heating & 913 Air Cond. Div., Lebanon, Ind.**
Gas and oil furnaces, boilers and air conditioning equipment.

**548 Stoddard Industries, Inc., Chicago, Ill.**
Electrostatic air filters.

**1045 Sturtevant Div., Westinghouse Electric Corp., Hyde Park, Boston, Mass.**
Air handling equipment.

**736 Sundstrand Hydraulic Div., Sundstrand Machine Tool Co., Rockford, Ill.**
Fuel units and pumps for oil burners.

**606 Sun-Ray Burner Mfg. Corp., Jamai-608 ca, N. Y.**
Oil burners, fuel supply pumps and domestic oil-fired water heaters.

**222 Swartwout Co., The, Cleveland, Ohio.**
Roof ventilators and automatic damper.

**525 Taco Heaters, Inc., Cranston, R. I.**
Pumps, heat exchangers; valves and fittings.

**1038 Tecumseh Products Co., Tecumseh, Mich.**
Hermetic air conditioning compressors, and window cooler compressors.

**703 Temco, Inc., Nashville, Tenn.**
Continuous film slides and sound track illustrating complete line of gas heating equipment.

**6 Thatcher Furnace Co., Garwood, N. J.**
**8** Warm air heating line; packaged heating boilers.

**S-91 Thermac Co., Corona, Calif.**

**16 Thermal Engineering Corp., Houston, Texas.**
Central plant air conditioners, heating and ventilating units, air-cooled condensers, and cooling coils.

**C-20 Thermo-Base Div., Gerwin Industries, Inc., Michigan City, Ind.**

**C-158 Thermobloc Div., Prat-Daniel Corp., So. Norwalk, Conn.**
Infra-red radiant heater; warm air heaters.

**S-111 Thermo-Pak Boilers, Inc., Alhambra, Calif.**

**S-98 Thermowheel, Inc., Long Island City, N. Y.**

**1014 Thrush & Co., H. A., Peru, Ind.**

**200 Titus Mfg. Corp., Waterloo, Iowa.**
Diffusers, registers, and grilles.

**901 Titusville Iron Works Co., The, Titusville, Pa.**
3-pass complete wet back Scotch marine boiler and water tube package steam generator.

**32 Toridheet Div., Cleveland Steel Prod-34 ucts Corp., Cleveland, Ohio.**
Gas and oil-fired furnaces, oil-fired packaged boilers, conversion gas and oil-fired burners, and cooling equipment.

**708 Torrington Mfg. Co., The, Torring-710 ton, Conn.**

**902 Trane Co., The, La Crosse, Wis.**
**906** Turbine compressors, air cooled con-
**910** densers, water chiller, steam special-
**918** ties, roof ventilators, baseboard, unit heaters, air handling units, and residential heating and cooling equipment.

**S-5 Trerice Co., H. O., Detroit, Mich.**

**60 Trion, Inc., McKees Rocks, Pa.**
Mobile laboratory, fully equipped to demonstrate air cleaner test methods; electronic air cleaners.

**807 Tube Manifold Corp., N. Tonawanda, N. Y.**
Filter-driers, liquid receivers, receiver-driers and mufflers.

**C-15 Tuttle & Bailey Div., Allied Thermal Corp., New Britain, Conn.**

**301 Typhoon Air Conditioning Co., Div., Hupp Corp., Brooklyn, N. Y.**
Self-contained air conditioning units; heat pumps.

**818 United Sheet Metal Co., Inc., Colum-820 bus, Ohio.**
Pipe and fittings; sound absorbers.

**240 United States Air Conditioning Corp., Delaware, Ohio.**
Room heating and cooling units, air-cooled condensing unit, and self-contained packaged air conditioner.

**713 United States Register Co., Battle Creek, Mich.**
Residential and commercial air conditioning registers and grilles; diffusers, return air vents and dampers.

**17 Universal Diffuser Corp., Tuckahoe, N. Y.**
Diffusers, registers and grilles.

**C-56 Universal Dynamics Corp., Arlington, Va.**

**C-22 V. & E. Products, Inc., Schuylkill Haven, Pa.**
Packaged oil and gas-fired boilers and boilers.

**643 Valveblower Co. of Calif., Inc., Div., Airflow Co. of Calif., Santa Fe Springs, Calif.**

**739 Van-Packer Company, Div., The Flintkote Co., Chicago Heights, Ill.**
Chimney, industrial smoke stack, and metal gas vent.

**C-156 Vapor Heating Corp., Chicago, Ill.**
Water tube boilers.

**14 Velocity Power Tool Co., Pittsburgh, Pa.**
Power stud hammer, stud driver and portable pipe threader.

**C-42 Vibration Eliminator Co., The, Long Island City, N. Y.**
Vibration eliminator mounts.

**347 Vibration Mountings, Inc., Corona, N. Y.**

**18 Victaulic Co. of America, Elizabeth, N. J.**
Couplings and fittings for grooved-end pipe.

**402 Viking Air Products Div., National-U. S. Radiator Corp., Cleveland, Ohio.**

**S-28 Vilter Mfg. Co., The, Milwaukee, Wis.**
Compressor connected to a 60 hp motor.

**219 Volcano Burner Mfg. Co., New York, N. Y.**
Oil burners; hot water heater; sump pump.

**1034 Vulcan Radiator Co., Hartford, Conn.**
Finned tube radiation and enclosures for commerical, institutional and residential heating; schoolroom heating and ventilating systems; electric baseboard.

**718 Wagner Electric Corp., St. Louis, Mo.**
Fractional and integral horsepower motors.

**405 Walker Mfg. & Sales Corp., St. Joseph, Mo.**
Barometric draft controls, draft inducers, and chimney caps.

**634 Walton Laboratories, Inc., Irvington,**
**636 N. J.**
Industrial and commercial space type humidifiers, and residential units.

**443 Warren Engineering Co., Div., Warren Automatic Controls Corp., Broadway, N. J.**
Controls, valves, strainers and gages.

**602 Waterloo Register Co., Inc., Cedar Falls, Ia.**
Grilles, registers, dampers, volume controllers and door ventilators.

**204 Waterman Waterbury Co., Minne-206 apolis, Minn.**
Heating and air conditioning units; oil and gas fired equipment.

**813 Watts Regulator Co., Lawrence, Mass.**
Boiler safety relief valves; water level controls.

**S-104 Weatherhead Co., The, Fort Wayne, Ind.**
Tube fittings, hose assemblies, receivers, driers, screw machine items, refrigeration valves, accumulators, controls and mufflers.

**335 Webster & Co., Warren, Camden,**
**339 N. J.**
Heating-cooling conditioners; unit heaters; steam specialties.

**705 Webster Electric Co., Racine, Wis.**
Fuel units and ignition transformers.

**906 Weil-McLain Co., Michigan City,**
**907 Ind.**

**S-27 Westcott Snyder Mfg. Corp., Madison, N. J.**
Heating and cooling convectors; boilers; baseboard radiation.

**317 Western Brass Mills Div., Olin**
**321 Mathieson Chemical Corp., East Alton, Ill.**

**1045 Westinghouse Electric Corp., Air Conditioning Div., Staunton, Va.**
Electronic analog computer for determining home air conditioning requirements

**1099 Westinghouse Electric Corp., Apparatus Div., Pittsburgh, Pa.**
Motors and controls for motors.

**734 Wheel Trueing Tool Co., Detroit, Mich.**
Drill bits, drilling machines, motors and drilling accessories.

**501 White-Rodgers Co., St. Louis, Mo.**
Automatic controls for heating and air conditioning.

**2 Wiegand Co., Edwin L., Pittsburgh, Pa.**
Electric heating and ventilating products.

**502 Williams-Oil-O-Matic Htg. Co., Div., National Union Electric Corp., Columbus, Ohio.**
Oil and gas-fired furnaces, air conditioners, and oil burners.

**114 L. J. Wing Mfg. Co., Div., Aero Supply Mfg. Co., Inc., Linden, N. J.**
Revolving unit heater; door heater; draft inducer; auxiliary steam turbine.

**448 Wiremold Co., The, Hartford, Conn.**
Flexible air duct.

**239 Wolverine Tube Div., Calumet & Hecla, Inc., Allen Park, Mich.**

**444 Wood Co., John, Heater and Tank Div., Conshohocken, Pa.**

**129 Worthington Corporation, Harrison,**
**133 N. J.**
Packaged air conditioning equipment; refrigeration compressors.

**207 XXth Century Heating & Ventilating Co., The, Akron, Ohio.**

**C-43 Yeats Appliance Dolly Sales Co., Milwaukee, Wis.**
Appliance dollies and covers.

**150 York Div., Borg-Warner Corp., York,**
**250 Pa.**
**350** Hermetic centrifugal and reciprocat-
**450** ing compressor systems, water chilling systems, induction units, absorption system, residential heat pump, furnaces and room air conditioners.

**817 York-Shipley, Inc., York, Pa.**
**821** Hot water boilers; furnaces.
**825**
**831**

**848 Young Radiator Co., Racine, Wis.**
New lines on the following: air conditioning units, baseboard heating, convectors, unit heaters, and coils.

**426 Young Regulator Co., Cleveland, O.**
Registers, grilles and regulators.

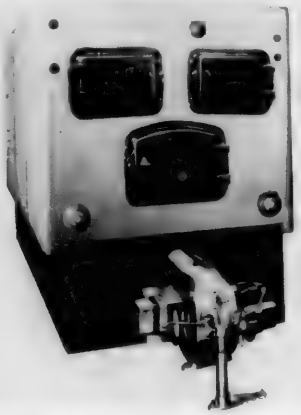
**633 Zatko Metal Products, Euclid, Ohio.**
Steel pulleys, belts for blowers.

# NEWS OF EQUIPMENT AND MATERIALS

**Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.**

## Boiler-Burner Unit

Announced by Weil-McLain Co., Michigan City, Ind., the B-HO-44 oil heating unit is I-B-R rated with a net load range of 1,145,000 to 2,709,000 Btu per hr, or 4,770 to 11,290 sq ft EDR (steam).



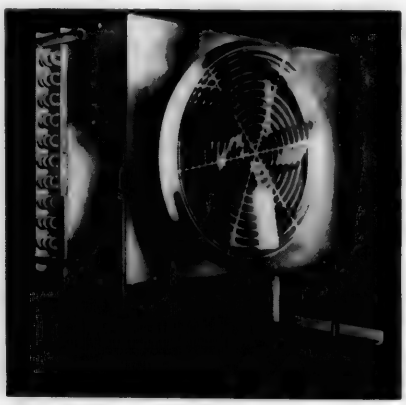
The oil burners designed for this cast iron boiler-burner unit incorporate the delayed oil flow principle and the latest in electronic safety primary controls as standard equipment, the company states.

**More information? Circle Item 1, postcard, last page.**

## Air-Cooled Condensers

A line of air-cooled condensers in 3 to 50 ton sizes is introduced by Typhoon Air Conditioning Co., Brooklyn, N. Y., a division of Hupp Corporation. The company is also offering a Win-trol valve that automatically maintains proper balance between remote air-cooled condenser and compressor at all ambients during winter operation.

Condensers are available in eight models with air movement ranging from 2,750 to 40,000 cfm. The two smallest models, of 3 and 3.8-ton nominal capacities, are direct driven. The other twelve are belt driven. Efficient coil design permits high air volume at low speed, the company states. The four-bladed deep-pitch fans are driven at 1140 rpm, in the direct-driven units, and 455 to 685 rpm in the larger units.

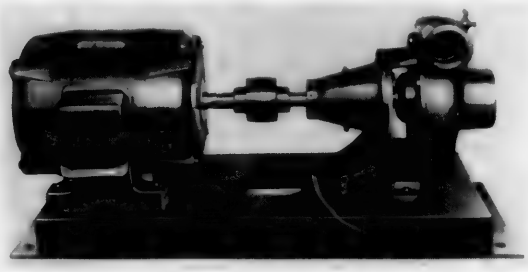


The balancing valve is installed in the liquid line between condenser and receiver. It remains (normally) closed until condensing pressure reaches a pre-determined setting. As ambient temperatures drop, pressure falls correspondingly, and the valve closes. Coils in the air-cooled condenser begin to fill with liquid, reducing condenser surface, until condensing pressure reaches that for which the valve is set. Use of the valve is said to provide quick start-up on cold days without seasonal change of controls.

**More information? Circle Item 2, postcard, last page.**

## Cradle-Mounted Pumps

Its CCB line of cradle-mounted, centrifugal pumps is announced by Federal Pump Corp., Brooklyn, N. Y. Designed specifically for hot and chilled water circulating systems, each unit consists of a pump, direct-driven through a flexible spacer-type coupling; and motor, mounted on a heavy structural steel bedplate. Coupling spacer shown on shaft between pump and motor is removable, permitting disassembly of cradle and impeller without disturbing piping.



According to the manufacturer, shafts, bearings, and flexible spacer are oversized to insure quiet mechanical operation, and hydraulic noise is held to a minimum by volute design which converts velocity head to pressure head in an efficient manner.

**More information? Circle Item 3, postcard, last page.**

## Fastener for Light-Gage Metal

A new fastener, said to greatly expand the use of the Shure-Set multi-purpose tool, is announced by Ramset Fastening System, Olin Mathieson Chemical Corp., Cleveland, Ohio.

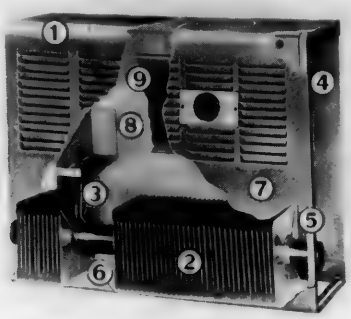
Called Skrew-Set, the fastener is designed to fasten light-gage metal. Some typical fastening applications include pre-drilled straps to air ducts; under-floor duct header straps to steel decking; temperature control tubing clips to furnace sides; and metal ducts and inside wiring clips to metal partitions, metal baseboards, door bucks and metal furniture.

**More information? Circle Item 4, postcard, last page.**

## Finned-Tube Radiation

Radiant-Ray Radiation, Inc., Newington, Conn., announces its factory-assembled, custom-fit Sil-vector airfoil radiation for efficient, economical heating of contemporary buildings. It is said to be particularly efficient where large glass window or wall surfaces create heating problems.

Some features of the radiation are pointed out in illustration: 1, die-formed heavy-gage steel enclosure has



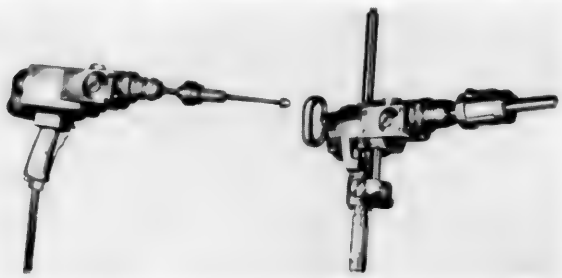

full slotted louvers for maximum heat distribution; 2, aluminum fins are mechanically bonded to copper tubing which is supplied in lengths to 8 ft; 3, simplified adjustable element hanger; 4, steel back plate is pre-punched for easy wall mounting; 5, welded channel steel provides added enclosure support; 6, free opening permits uninterrupted flow of air into heating fins; 7, smooth surface finish; 8, element mounting bracket slips into grooves; and 9, lightweight, prime-coated steel blade damper.

The radiation is available in a choice of eight hammertone enamel colors over a prime coat. It may also be supplied with a grey prime coat for finishing on the job.

**More information? Circle Item 5, postcard, last page.**

## New Tube Expander Drives

Addition of two air-driven heavy duty models to its Torq-Air-Matic line of automatic tube expander drives is announced by Thomas C. Wilson, Inc., Long Island City, N. Y. With the addition of these models, the line



now provides a complete range of equipment for uniform tube rolling.

Model B, at left in illustration, is available in three versions, ranging from 38 to 22 ft-lb torque and from 450 to 750 rpm. It is designed for heat exchangers, and may be used with ferrous or nonferrous tubes ranging up to 1½ inches OD.

Model C, shown at right, which is available in one size, 75 ft-lb torque and 200 rpm, is designed for tubes used in package or power plant boilers, condensers, sulphite evaporators, air-preheaters, etc. It will roll tubes up to 3 inches OD in ⅝-inch sheet.

**More information? Circle Item 6, postcard, last page.**

## Adjustable Speed Sheave

A simplified, adjustable speed sheave, called the Adjustex sheave, is introduced by Allis-Chalmers Manufacturing Co., Milwaukee, Wis. The sheave is available for A, B and C-section belts in two, three and four-groove construction. Pitch diameter sizes parallel the former Vari-Pitch sheaves. One entirely new diameter for C section belts— 7.5/9.7 inch pitch diameter—is available for higher speed and wider speed range applications. Design capacities to 75 hp are covered by 33 sizes.

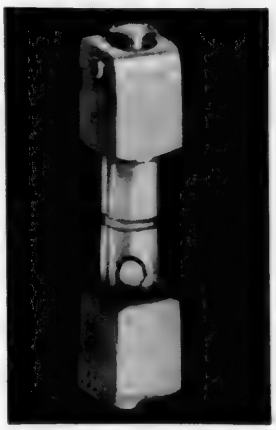
A completely new concept of pitch diameter adjustment is said to be featured in this sheave. Interdigitated lug disc design is retained. Adjustment is made through a single adjusting screw and a hollow lock screw. Relative position between stationary and movable discs is positively maintained at all pitch diameters without disc to main sleeve set screws.

The sheaves offer economy through reduced initial cost, reduced maintenance cost, lighter weight, reduced overall length, reduced bearing loads, and improved balance at all pitch diameters, the company reports.

**More information? Circle Item 7, postcard, last page.**

## Ball Signals Filter Change

Sensitive air filter gages, manufactured by Henry G. Dietz Co., Inc., Long Island City, N. Y., are used for applications requiring a means of determining when filters are clogged and need replacement or cleaning.



When filters are new, the white ball is below mark on the indicating plastic tube, as illustrated. When filters build up too much resistance to operate efficiently, the ball is above the mark. One model available is used in the pressure range of 0.04 to 0.15 inches of water, and will indicate an increase in pressure of 0.01 inch. Another model is used in the 0.15 to 1.0 inch range, indicating an increase in pressure of 0.02 inch.

Operation at a specified pressure is obtained by adjusting a valve located in the top brass fitting of the gage. Gage will indicate either pressure or vacuum, and can be fitted to register a differential pressure. Applications include air-cooled electronic equipment, air conditioning systems, and unit air conditioners.

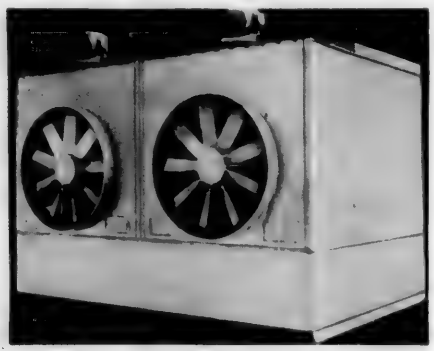
**More information? Circle Item 8, postcard, last page.**

**1958 Annual Index**

**The annual index to the 1958 issues of AIR CONDITIONING, HEATING AND VENTILATING has been completed. Subscribers may obtain copies by requesting the 1953 Index on a postcard addressed to the Subscription Department, Air Conditioning, Heating and Ventilating, 93 Worth St., New York 13, N. Y.**

## Tower Line Expanded

With the addition of three models, The Marley Co., Kansas City, Mo., has extended the capacity of its packaged Aquatower line to 120 tons. The new models are two-fan units with divided hot water basin and dual cooling chambers mounted on a common cold water



collecting basin. Two-fan design permits single-cell operation if desired, providing broad flexibility of operation and very close control of cold water temperatures, the company states.

Increased capacities available with the two-fan units make them well suited for many industrial process water cooling applications in the 250-400 gpm range. Shipped as a unit, towers reach their point of service completely assembled.

**More information? Circle Item 9, postcard, last page.**

## Heat Pump Leads '59 Line

A new home Comfort Center to do both heating and cooling, and a miniaturized heat pump were among the products in its 1959 line announced by York Corp., York, Pa., a division of Borg-Warner Corporation.

The heat pump is a house-sized version of the commercial unit developed by the company in 1956. So pleased is it with the success of this miniaturization, the company states, that it offers a 5-yr warranty on both the cooling and heating circuits. Electrically powered, the unit is said to function efficiently with outside air from zero, when heating, to 115 deg F, when cooling.

The Comfort Center is a packaged furnace and air conditioner fitted with company's Silver V gas burner, an electronic filter, and dual systems. Burner is said to spread flame more evenly over the heat exchanger for more efficient transfer. Filter will remove particles as small as bacteria and mold. One of the two air conditioning systems stays in reserve for peak loads.

Nineteen room air conditioners in three series are announced, starting with 7½ amp models and running trough deluxe units with reverse cycles, aluminum filters, and special muffler apparatus for extra-quiet operation. The company builds its own compressors, each piston being fitted with a high-tensile ring to compensate for wear and to maintain high compression for many seasons.

Three central, air-cooled systems, suitable for residential and commercial application, include the Pathfinder, described as a low-budget model; the Twinline, with two complete cooling circuits; and the Champion, for heavy-duty cooling to 15 tons.

Six Embassy line commercial and industrial air conditioners range in capacity from 3 to 22½ hp. All are packaged units said to be easily moved to meet changing requirements. They are compatible with both ducted and ductless air distribution systems.

Upflow, basement, and horizontal oil and gas furnaces are offered in deluxe and economy-priced series. A self-contained, prepackaged ice-maker, introduced originally in 1948, this year features a "selector dial". The user can dial for various shapes and sizes of ice. Units deliver from 200 to 8,000 lb ice per day.

**More information? Circle Item 10, postcard, last page.**

## Industrial Thermocouple

E. C. Smith Manufacturing Co., Conshohocken, Pa., announces a heavy-duty, fast-responding thermocouple. Called PermaKouple, the new thermocouple consists of a heavy protecting tube containing two No. 8 B&S gage wires completely embedded in solid ceramic. This thermocouple design was first tested and proven in small sizes in nuclear and aircraft fields, and is now available in standard thermocouple sizes.

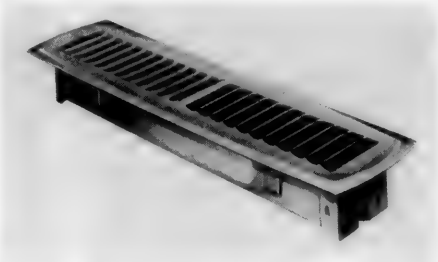
The tightly packed ceramic insulation (aluminum oxide) prevents corrosion or scaling of the wires, and eliminates the danger of flash fires in the event of a burn-through. Should the tube burn through, the ceramic pack will preserve a vaccum or keep poisonous fumes from escaping through the thermocouple tube.

It can be ordered in nominal 20-ft lengths or as complete thermocouple assemblies. Unitized construction requires the simplest of stocking procedures. Three sizes are available: ½, ¾, and 1-inch standard pipe diameters.

**More information? Circle Item 11, postcard, last page.**

## Perimeter Floor Diffuser

A low-cost perimeter floor diffuser, featuring a decorator-styled face, a dial-type operator and side expansion tabs, is produced by Air Control Products, Inc., Coopersville, Mich. Purpose of the company's exclusive expansion tabs is to hold the diffuser down in a rough-cut floor opening.



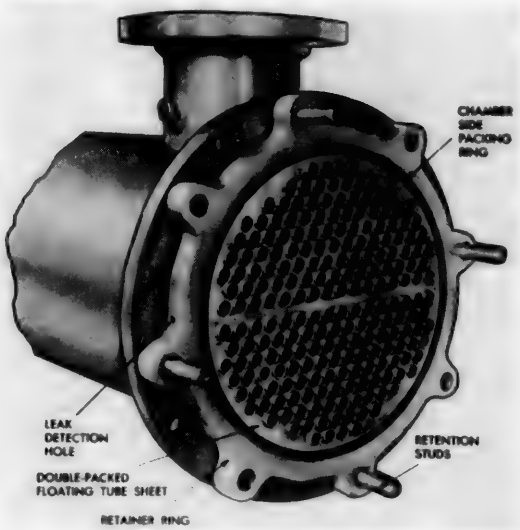
Double, opposed-action valve is used on 4-inch widths, single valve on 2¼-inch widths. An Adjusto-Stop is provided to permit balancing the system at the diffuser face, and the operator may be locked to avoid tampering. Vanes are adjustable to provide any desired air pattern.

Called No. 150, the floor diffuser is finished in Sierra-brown baked enamel and available in five sizes.

**More information? Circle Item 12, postcard, last page.**

## Exchanger Inspected Easily

A retainer ring design, to speed up and simplify inspection and service, is incorporated in Paracoil Type PC heat exchangers manufactured by Davis Engineering Corp., New York, N. Y. Exchangers are designed to handle either oil, water, air or gas. Straight tube construction permits easy cleaning, and use of a double-packed floating tube sheet eliminates expansion and contraction stresses.



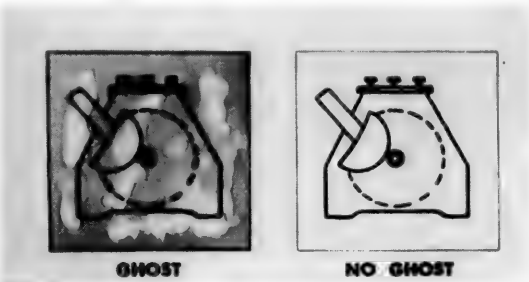

The feature of these exchangers is a type of packing retainer ring that permits shell side pressure tests to be made with the tube ends exposed. By backing off on only one set of nuts, the end bonnet can be removed. Retention studs hold the retainer ring and packing in place. Pressure can then be applied to the shell side of the exchanger to test for defective tubes or leaking tube joints. No auxiliary equipment or special devices are needed to hold the tube sheet packing against the test pressure. Tubes may be rerolled or even replaced without removing the tube bundle from the shell.

Mixing of shell and tube side fluids due to packing deficiency is impossible, the company states. Leakage from either side, resulting from loosening of bolts or worn packing, escapes through detection holes in the retainer ring, immediately notifying operating personnel to take corrective measures.

**More information? Circle Item 13, postcard, last page.**

## Pre-Printed Drafting Symbols

Stanpat, a tri-acetate pre-printed drafting symbol line, is now available with a new resin-base adhesive. According to the manufacturer, Stanpat Co., Whitestone, N. Y., the new adhesive will not cause an annoying ghost on the reproduction because it will not leach out the oils in tracing papers.




The company manufactures drafting symbols with two self-adhesive backings. The older rubber-base, with green backing sheet, should be used with tracing cloth but with only certain tracing papers. The new adhesive, identified with a red backing sheet, may be used with either cloth or paper. Information on use of the symbols, or which adhesive is better for your drafting paper, is offered.

**More information? Circle Item 14, postcard, last page.**

## Explosion-Proof Control

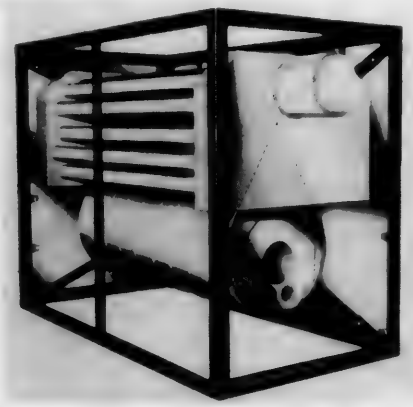
An explosion-proof pressure control, Type H95, is designed to control air, gas, or liquid pressures in hazardous locations where explosive vapors are present. Calibrated pressure settings are made by simply rotating a single-turn adjustment knob and pointer against a fixed, easily-read, calibrated dial, states the manufacturer, United Electric Controls Co., Watertown, Mass.

There are twenty-two models available in a variety of adjustable ranges between 0 and 500 psi, up to 600 psi in stainless steel models. Normally open, normally closed, or double throw types are offered. All switches are single pole and suitable for ambient temperatures up to 180 deg F. Standard rating is 15 amps at 115 or 230 volts a-c.

**More information? Circle Item 15, postcard, last page.**

## Stainless Steel Furnace

A line of stainless steel, heavy duty warm air furnaces, called Maxi-therm, is announced by Chicago Steel Furnace Co., Chicago, Ill. (The company will continue to manufacture its CSF line of refractory lined furnaces.) The new line includes horizontal furnaces and duct heaters, as well as upflow and counterflow units in capacities to 2,500,000 Btu per hr.



The line is said to be the first to make use of Type 442 stainless, a stronger steel new to the industrial furnace field. The two-pass combustion chamber has a ribbed tear drop design for longer life and greater efficiency; 12-gauge is standard on all larger models.

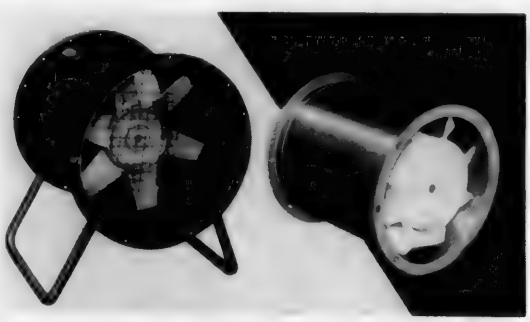
A one-piece frame is made possible through "quint-angle" construction. Other practical features include a tube and transfer box access plate, polished radiant shield, and a two-pass aluminized steel heat exchanger.

**More information? Circle Item 16, postcard, last page.**

## Tubeaxial Industrial Fans

A line of pressure type tubeaxial fans for use in industrial applications is developed by Propellair Div., Robbins & Myers, Inc., Springfield, Ohio. Supplementing present designs, these new fans may be used to handle air, fumes, and light dusts generally encountered in industry or in special machining operations.

Designated Type DT, fans are equipped with matched design motors and propellers, both of which are products



of the same manufacturer, thus carrying a single nameplate guarantee. They are available with propeller diameters of 8, 12, 16, 20, and 24 inches; sizes through 60 inches are under development.

All propellers are cast of a tough magnesium-aluminum spark-proof alloy and said to be of the latest airfoil designs, providing maximum efficiency over the pressure ranges at which they may be operated. Capacities range from 200 to 12,000 cfm from free air to 5 inches w.g. static pressure.

Totally-enclosed, "all-weather" motors power the fans. Where highly contaminated exhaust requires that the motors be outside of the airstream, belt-driven models with gas-tight belt tubes and cast iron bearing housings are available. Special corrosion resistant models with shaft seals are also available.

**More information? Circle Item 17, postcard, last page.**

## New Welding Fittings Line

Introduction of a line of welding fittings, tradenamed Husky, is announced by Nibco Inc., Elkhart, Ind.

Fittings are designed for normal (150 lb) installations. The line includes: straight and reducing tees, 45° and 90° elbows, and concentric reducers, 2 to 6 inches. Cold forming processes provide these fittings with smooth surfaces, which match perfectly with the pipe they connect, the company states. Also, roughing-in dimensions (center to end measurements) are the same as the nominal size of the fitting, up to, and including, 4 inches. In other words, a 3-inch tee has a 3-inch center-to-end dimension.

Suitable for any normal system, where the contractor wants to take advantage of welded connections, at costs which are competitive with threaded installations, welding fittings afford the advantage of a metallic bond at the joints, and because of the welding principle, none of the pipe needs to be cut away in a threading operation. This is said to assure a much stronger, longer lasting, system.

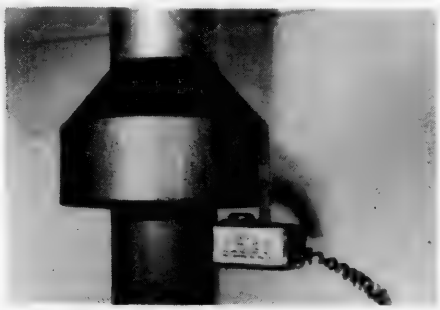
The line is made from A 106, Grade B. seamless carbon steel tube, which is the same material as the pipes they are intended to join. Fittings are actually stronger than the pipe, because of the manufacturing process, according to the company. A University of Pittsburgh study was cited to prove this point: A test set-up was subjected to 7750 psi of internal pressure and at that point the pipe fractured, leaving the fitting and the welded joints unharmed and undistorted.

**More information? Circle Item 18, postcard, last page.**

## Flue Spillage Guard

A spillage switch, called Spilswitch, which shuts off the gas burner in a heating system when flue products spill from the draft diverter into an occupied space, is announced by Wilson Industries, Inc., Brooklyn, N. Y.

Unit consists of a thermal disc which responds to the



presence of flue products by closing the gas supply and shutting off the burner. The burner will not recycle automatically, but must be reset by hand, so the homeowner or building engineer has to be aware of the no-draft condition before there can be any appreciable accumulation of products of combustion.

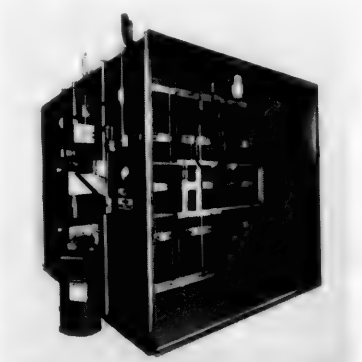
Switch is positioned at the relief opening of the diverter, and there are specific models for horizontal, vertical and barometric diverters. There are units applicable to residential and commercial-industrial gas heating and to gas room heater and gas water heater installations.

More information? Circle Item 19, postcard, last page.

## Cleaning Electronic Air Cleaners

Electro-air Cleaner Co., Inc., McKees Rocks, Pa., announces its Detergent-Adhesive System, Type X, and its cleaning-adhesive solution, DAX, which are said to solve the problem of how to completely get rid of the collected contamination on electrodes and plates of collecting cells in electronic air cleaners.

Previously, the company reports, advantages of a true electronic air cleaner often were lost because the washing system could not do an effective job of keeping the equipment clean. Air-borne dirt collected on the elec-



trodes and plates has a greasy texture and could not readily be washed off the collecting cells with just hot or cold water, even when a conventional adhesive (water soluble oil) was applied after each washing. After a series of washings and adhesive applications, the electronic air cleaner cells became coated with an unsightly black build-up that often led to service problems as well as lowered efficiency.

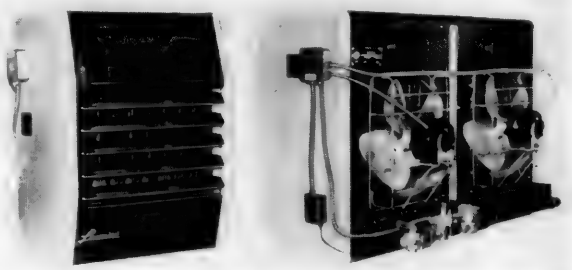
The company's "one operation" detergent-cleaner and adhesive solution, when mixed with wash water, promotes thorough washing of collecting cells; then dries and leaves an adhesive coating on collecting plates and electrodes. The applicator system for DAX is supplied as a package, and is available for electronic air cleaners that have already been installed and are in operation, as well as with new units. It works with either vertical traveling washing systems or with horizontal fixed washing systems.

More information? Circle Item 20, postcard, last page.

## Gas-Fired Unit Heaters

The C. A. Olsen Manufacturing Co., Elyria, Ohio, announces Luxaire direct-fired gas unit heaters for installation in commercial, industrial or farm buildings.

Approved by AGA for natural, manufactured, mixed,



or liquefied petroleum gas, the unit heaters are available with heating capacities of 60,000, 90,000, 120,000, 180,000 and 240,000 Btu per hr input. The three smaller sizes have a single heating element and fan, as shown at left in photo, while the two larger sizes are comprised of twin heating elements and twin fans, housed in the same cabinet, as shown in rear view at right.

Operating noise has been reduced to a minimum, the company states. Speedier ignition and more efficient combustion are achieved with new stainless steel ribbon burners, inserted into tapered steel burner heads.

More information? Circle Item 21, postcard, last page.

## Valves Have Mercury Switches

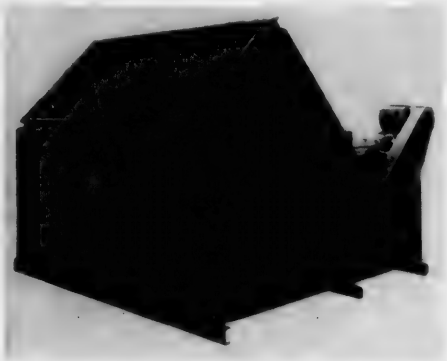
Silent mercury switches are now a standard feature of all Edwards motorized zone control valves, it is announced by Edwards Engineering, Inc., Pompton Plains, N.J. The mercury switches are completely enclosed, hermetically sealed, and completely silent with an indefinite shelf and operating life, the company reports.

The motorized valves are used to control Zone-A-Matic heating systems in homes, motels, hotels, apartments, offices, hospitals and similar multi-zone buildings.

More information? Circle Item 22, postcard, last page.

## Heats, Cools Simultaneously

MC multi-zone air conditioners that heat and cool simultaneously are manufactured by McQuay, Inc., Minneapolis, Minn. Units are specifically designed and engineered to meet the conditions where outside weather or inside requirements make it necessary to heat some sections of a building at the same time other sections require cooling.



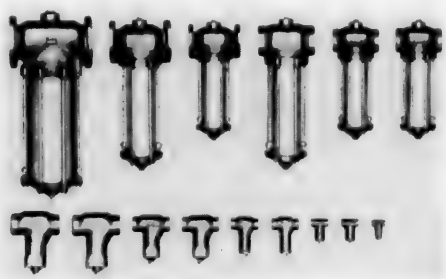
Where these conditions exist, the multi-zone unit will furnish balanced comfort simultaneously to the different determined areas with either filtered, cooled, and dehumidified air, or with filtered, heated and humidified air, or a mixture of either in any desired proportions, the company states.

Available in 11 sizes from 1,370 to 38,000 cfm, each unit has a standard number of zone dampers available from 6 on the smallest to 22 on the largest. All zones are interconnected by single external connecting rod. A full line of accessories is also available, including preheat steam coils, filter sections, mixing boxes, and humidifiers.

**More information? Circle Item 23, postcard, last page.**

## Line Strainer Series Extended

An expanded range and choice of materials in its line strainer series is announced by Spraying Systems Co., Bellwood, Ill. Strainers are now supplied in a range of threaded pipe connection sizes from ¼ to 4 inches, and with flanged connections for 3, 4 and 6-inch pipe sizes. In addition, all strainers are now available in stainless



steel as well as in brass and cast iron. Screen areas for each size are unusually large, the company states. Each strainer can take up to 75% blocking with less than a ½-lb pressure drop under normal flow conditions. Dual screen design gives a heavy outside screen to protect against surge and bursting and a fine-mesh inside screen for straining. Screens are supported top and bottom by flange collars to provide seal fit and rigidity.

Strainers are said to be easily flushed. Larger capacity strainers are equipped with top outlet for gage mounting. Also included are special line strainers for high pressure lines up to 5,000 psi.

**More information? Circle Item 24, postcard, last page.**

## Boiler Shot Cleaning System

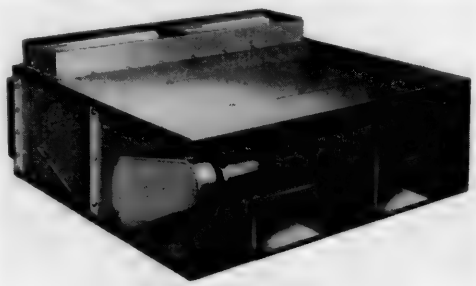
Diamond Power Specialty Corp., Lancaster, Ohio, announces the consummation of a licensing agreement with A. Ekstroms Maskinaffar, of Stockholm, Sweden, covering the Broman-Ekstrom shot cleaning system. This system offers improvements in cleaning certain heating surfaces such as tubular airheaters, horizontal superheaters, reheaters and economizers.

Cleaning is accomplished by cascading steel shot uniformly over the heating surface. The shot is recovered and reused indefinitely, being automatically recirculated by a pneumatic system.

**More information? Circle Item 25, postcard, last page.**

## Components Allow Custom Jobs

A line of heating and ventilating units in sizes to accommodate applications in all types of buildings has been announced by Modine Manufacturing Co., Racine, Wis. Eight sizes range in air volume capacity from 600 to 33,000 cfm. Units are offered in five types for horizontal, ceiling, inverted, vertical, and floor mounting.



A complete line of components is available to permit custom-designed installations of heating and ventilating equipment to meet any building requirement. Components consist of combination filter-mixing boxes; standard mixing boxes; flat, medium and high-capacity filters; external and internal face and by pass dampers; fixed and swing nozzles; legs, discharge and return air plenums; wall intake boxes; humidifiers; vibration isolators, standard steam and steam distributing heating coils.

A complete catalog is offered to engineers. It incorporates innovations facilitating selection and ordering of basic unit fan sections and components.

**More information? Circle Item 26, postcard, last page.**

*(Continued on page 116)*

# Unusual and Standard Heating Problems

## Met with 22,621 Installations, 150—17,500,000 Watts

### Package Units Sized to Your Specifications Save You Design and Layout Work, Field Time — Cover Many Industrial, as well as Conventional Applications

You are invited to write for INDEECO catalogs discussing a wide variety of special and standard heating problems.

A growing trend toward Blast Coil Heaters as sole or supplementary sources of heat; or for special applications, has been hastened by many advantages and new Indeeco developments.

These advantages include: (1) Dependable performance. (2) Substantial design and field savings. You may obtain packaged units to fit your special requirements at no extra cost whatsoever. (3) Special applications to unusual heating problems.

#### How Constructed

INDEECO Blast Coil Heaters come as complete package units in any size desired. Completely wired for connection to the power system, constructed and marked for installation in minimum time. THERMAL CUT-OUTS furnished with each unit. Terminal boxes are large. Knockout holes of proper size to conform with National Electric Code included in bottom of terminal box of duct heaters. Wide field experience has enabled anticipation of most installation problems and adequate provision for them in advance.

#### A Few Types of Service Rendered

(1) As primary source of heat in buildings. (2) For booster or supplementary heating. Example: Industrial plants in which central heating plant is shut down at night or on weekends — to heat offices of executives. (3) For ZONE temperature control—described fully in new INDEECO literature. (4) For industrial applications. Example: For a major oil refinery, seven pumping stations which have no attendants are heated by INDEECO Blast Coil Heater installations.

**More Than 100 Installations in Rockefeller Center**

Numerous installations for major companies, institutions and government projects throughout the U. S.

### Useful for Reference INDEECO CATALOGS

Write or mail coupon below for INDEECO BLAST COIL HEATER CATALOGS. Kept on file, they may be useful in many special situations.

**MAIL for CATALOGS**

INDUSTRIAL ENGINEERING AND EQUIPMENT CO.
24A Hanley Industrial Court, Brentwood 17, Missouri

Send copies of INDEECO BLAST COIL HEATERS CATALOGS.

Individual's Name.....

Company Name.....

Address.....

.....

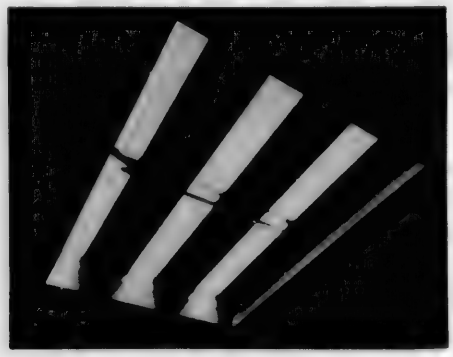
## INDUSTRIAL ENGINEERING and EQUIPMENT CO.

24A Hanley Industrial Court, Brentwood 17, Missouri

*(Continued from page 114)*

## Ventilator Doubles as Skylight

Development of a high capacity gravity roof ventilator that doubles as a skylight is announced by the Swartwout Co., Cleveland Ohio. Called the Lite-'n-Aire, this unit has translucent glass fiber dampers and gutters that provide natural light without the additional cost of separate skylights.



Glass fiber dampers and gutters are strong, non-warping and resistant to damage from fumes and chemicals, the company states. Whether translucent dampers are open or closed, the light transmitted by the unit is well diffused and does not have isolated hot spots with accompanying glare.

Tests are said to prove that units can be used as the primary daytime light source in many applications. For example, with a 15-ft. high ceiling on a cloudy dull day, one unit with dampers closed provides the recommended standard of general illumination suggested for lockers, hangar and storage areas.

**More information? Circle Item 27, postcard, last page.**

## Flexible Metal Connectors

A complete line of general purpose flexible metal connectors has been developed by The Korfund Company, Inc., Long Island City, N.Y., featuring a unique braid design providing especially high burst strengths. It is said to be the only hose having a written, one-year warranty against defects of material and workmanship.

Designated Flex-Hose, these flexible metal hose sections attenuate transmission of vibration and pulsations into the rigid piping. They isolate pipe lines from pumps,

compressors, air conditioners, radiators, air handling units, fuel lines, etc., which create objectionable vibration. They also compensate for misalignment and reduce strain on piping.

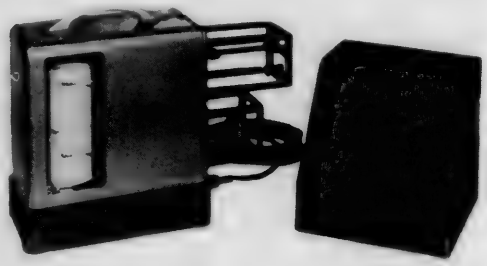
Maximum steady working pressures at 70 deg F vary with size up to 1700 psi. Operating temperatures can be as high as 750 deg, depending upon materials used. Pressure ratings can be increased by as much as 75% by use of multiple braiding.

Series B Flex-Hose has bronze tubing, single bronze braiding, and brazed fittings, for 12 pipe sizes from ¼ to 4 inches ID (stock lengths 8 to 27 inches). Series S has steel tubing, braided steel wire, and welded fittings, all hot-dipped galvanized, for 7 pipe sizes from 5 to 16 inches ID (stock lengths 31 to 72 inches). Hose is also available in stainless steel and monel for special applications.

**More information? Circle Item 28, postcard, last page.**

## Humidity, Temperature Recorder

An indoor-outdoor two-section high-accuracy humidity and temperature recorder, with variable range limit alarm, is available from Serdex, Inc., Boston, Mass. Accuracy of ± 3% is obtained over the 15% to 95% relative humidity operating range at temperatures from +32 to +130 deg F. Accuracy is derived from an exclusive



circular "animal membrane" humidity sensing diaphragm, the company reports. The temperature-sensitive element of cantilever type bi-metal is guaranteed accurate within ±1 deg from 0 to 100 deg.

Alarm range is determined by locating electrical contact blocks on a positioning post in the Sensing Section. If a recording pen contact touches one of the limit blocks, the alarm circuit is energized until manually reset. Switches on the Signal Cabinet provide for manual reset of the alarm, shutting off the alarm circuits during down periods, and eliminating the audio section of the alarm so that only the visual alarm is energized during out of control periods. Cabinet may be remotely located.

**More information? Circle Item 29, postcard, last page.**

## Self-Contained Air Conditioners

Self-contained water-cooled air conditioners in 15, 30, 45, 60, and 75-ton capacities are introduced by Typhoon Air Conditioning Co., Division of Hupp Corp., Brooklyn, N. Y. They incorporate two, three, four and five 15-hp hermetic compressors, respectively. The 75-ton unit is said to be the first of its size on the market.

Steam heating coils are available with all models.

**More information? Circle Item 30, postcard, last page.**

*(Continued on page 118)*

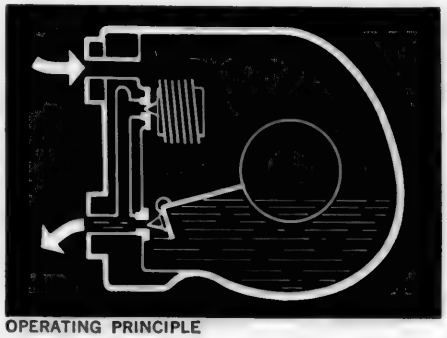
# To help you select the right steam trap . . .

# Here's a functional comparison of

# FLOAT-THERMOSTATIC and INVERTED BUCKET types

In specifying any steam trap it is important to make certain that the type selected will do the job for which it is intended. Occasionally, the design and operation of Inverted Bucket and Float-Thermostatic steam traps are confused. Since Sarco makes both types, in addition to the three other forms of steam traps, we feel qualified to offer the comparisons which follow.

## This is a FLOAT-THERMOSTATIC TRAP



OPERATING PRINCIPLE

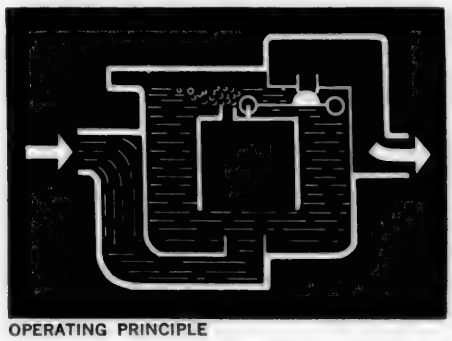
When a specifying engineer specifies a float-thermostatic steam trap, he is clearly calling for a definite, recognized, specific construction and type of operation:

1. A *sealed float* operating the condensate discharge valve; and

2. A *balanced-pressure thermostatic air vent*, controlling a separate discharge port, solely for the release of air and gases. Such an air vent fully discharges starting air and also air at temperatures approaching that of steam, regardless of pressure.

Such a trap discharges condensate continuously at a rate varying directly with the rate of steam consumption. This is why the "F & T" is first choice for applications such as unit heaters, blast heaters, air heating coils and heat exchangers.

## This is an INVERTED BUCKET TRAP



OPERATING PRINCIPLE

Condensate is controlled by a valve operated by the sinking of an inverted bucket. When filled with steam or air the bucket floats in a water seal and the valve is closed. Air and/or steam escapes through a vent hole in the top of the bucket; the bucket loses buoyancy and opens the valve. Steam follows, filling the bucket, re-closing the valve.

In the inverted bucket trap (sometimes called the "open float" trap) air is discharged only after passing through the hole in the top of the bucket, then through the valve seat. A bi-metallic air vent can be fitted in the bucket, allowing freer air flow on start-up. Or the air vent may control a by-pass valve around the main valve. Either way, the vent is effective only at temperatures up to approximately 200°F.; this kind of vent is not self-adjusting for varying steam pressures. The trap closes with a bucket of steam; on each discharge, a bucketful of steam is lost.

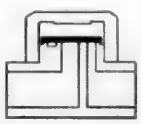
8114B

*On every problem that needs* production planned *steam trapping, you can rely on impartial advice from Sarco, because only Sarco makes all 5 types of traps.*

Float-Thermostatic

Thermostatic

Liquid Expansion



Thermo-Dynamic®

Inverted Bucket

**SARCO**
**COMPANY, INC.**

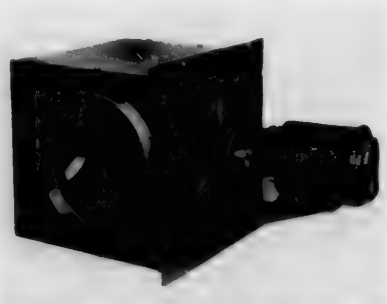
635 Madison Avenue, New York 22, N. Y.

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

*(Continued from page 116)*

## Improved Draft Inducer

Size 10-D draft inducer, with improved, rugged design for large residential and small commercial heating plants, is announced by L. J. Wing Mfg. Co., Linden, N. J. Flue gas handling capacity is up to 8½ gph of oil and 1100 cfh of natural gas.



Adequate draft at all times, regardless of varying weather conditions, is assured. The unit eliminates the need for tall, unsightly stacks, with savings in stack erection and maintenance costs. Unit can be mounted horizontally or vertically in the breeching to provide maximum flexibility for the draft inducer itself and the location of the heating plant.

The motor and fan assembly are one unit, easily withdrawn for servicing. The bearings are air-cooled, and the fan requires no lubrication.

**More information? Circle Item 31, postcard, last page.**

## Large Diameter Plastic Pipe

A development by Semet-Solvay Petrochemical Div., Allied Chemical Corp., called A-C polyethylene pipe compound, permits the extrusion of plastic pipe to very large diameters. It is presently available from Carlon Products Corp., Aurora, Ohio, in diameters up to 8 inches, though much larger sizes have been produced in pilot plant operations.

The compound consists of very heavy molecules, and new extrusion technique and die design preceded commercial production. According to the chemical company, test data show that the pipe will have a life expectancy of 50 years, at pressure ratings several times higher than that of conventional polyethylene. Further, it is said that investigation shows no cracking, slitting, or pin holing in the pipe. Pipe compound may be considered to be intermediate between rubber, which has high flexibility and low strength, and more rigid plastics, which have high strength and low flexibility.

Pipe can be made in any length desired and is easily joined by flanging of the ends. Illustration shows pipe connected with a Van Stone flange. The pipe itself is flared with a gentle heat. In many cases no gasket is required. The compound from which it is made is approved for potable water installations by the National Sanitation Foundation.

**More information? Circle Item 32, postcard, last page.**

## Pressure Reducing Valve

An economical pressure reducing valve offering increased flow is introduced by O. C. Keckley Co., Skokie, Ill., to serve steam, air, water, oil and gas applications.

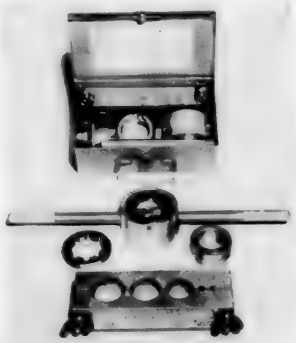
The valve, No. 11A, is said to have two outstanding features: (1) A full-ported orifice permits higher capacities; (2) It provides economical, satisfactory service for a great many applications presently requiring larger and/or more expensive valves.

Single-seated valve has a semi-steel body, bronze trim, composition disc, and is suitable for initial pressures up to 250 lb. Reduced pressures range from one to 100 lb. Spring ranges: 1-20 lb; 15-50 lb; and 40 to 100 lb.

**More information? Circle Item 33, postcard, last page.**

## Tube Tool and Holder

Brass tubing is threaded with ease and precision when the job is done with a tube threading tool and holder, according to a manufacturer of such equipment, J. A. Sexauer Manufacturing Co., New York, N.Y.



Called the Sexauer 3-in-1 Tubing Threader, this tool comes with 3 dies and guides, easily interchanged, for cutting a 27 thread on 1¼, 1⅜ and 1½-inch diameter brass tubing.

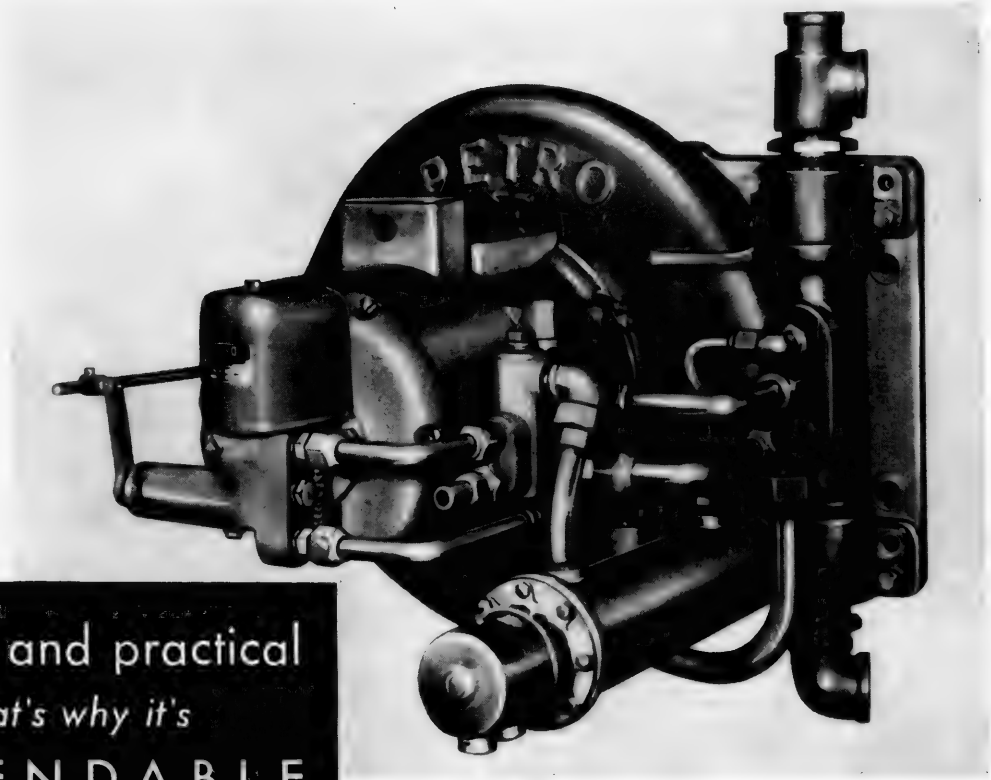
The companion unit, the Sexauer 5-in-1 Tubing Holder, is made of Tenzaloy, a high tensile strength aluminum alloy. The holder grips ¼, 5/16, 1¼, 1⅜ and 1½-inch tubing, protects it from damage and distortion, and holds it rigidly for threading, flaring or cutting.

Both the tubing threader and tubing holder fit compactly into the metal carrying case that comes with these units.

**More information? Circle Item 34, postcard, last page.**

*(Continued on page 120)*

# Petro HEAVY OIL BURNER




## Simple and practical *that's why it's* DEPENDABLE

Residual oils are low cost fuels. They have higher heat value than light oils, and usually cost less per gallon. But in spite of their economy they are often avoided because they are considered difficult to handle and burn. A moderate change in temperature can change them from a fluid to a sluggish semi-solid.

These heavy oils (Nos. 5 and 6) are easily controlled and burned by the Petro system which is remarkably free from mechanical complexities.

1. A simple oil heater automatically warms the oil to a point where a common viscosity is reached. (Fuel oils approach this at a temperature of about 160 degrees).

2. An automatic valve passes the oil to the nozzle only when it is warm enough for accurate metering and instant ignition.

This is the basis of the Petro "Thermal Viscosity Principle." The Petro burner isn't fancy; it isn't temperamental; but it *stays on the job.*

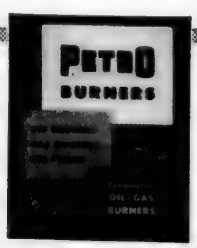
In spite of its ruggedness, the Petro heavy oil burner is precision equipment which will operate efficiently with any type of automatic control system.

Petro oil burners have been the steady, reliable work horses in heavy oil firing for over 50 years. They have saved their owners untold thousands of dollars in low fuel and maintenance costs.

For further information, please mail coupon.

**Send for this PETRO® catalog**

***Over 50 years of leadership in automatic heating and power equipment***




PETRO, 3324 W. 106th St., Cleveland 11, Ohio
In Canada, write to 80 Ward St., Toronto Ont.

Please send me literature and specification sheets on the money-saving Petro forced draft firing system.

Name_____
Company_____
Address_____
City_____ State_____

*(Continued from page 118)*

## Centrifugal Roof Ventilators

Introduced by Power Line Fan Co., Plainfield, N. J., is a new series of direct drive and belt drive centrifugal roof ventilators designed to move large volumes of air quietly and continuously at moderate static pressures.

Ventilators have all-steel housing consisting of welded

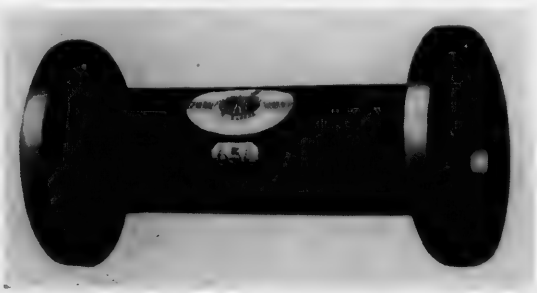
steel framework sheathed in heavy sheet steel with lock seam joints. Entire unit is completely weather-proof with special anti-corrosive protective coating. Bird screen of ½-inch mesh, mounted in a vertical plane on the sides of the wheel compartment, is provided as a standard item.

The company uses an all-aluminum, non-sparking, air-foil contoured blade which, in addition to its non-overloading characteristics, has proved itself in tests conducted in an AMCA-approved laboratory to be one of the most efficient designs on the market today, it is reported. This means lower operating costs and, when coupled with the venturi orifice, results in more air movement per horsepower, the company states.

**More information? Circle Item 35, postcard, last page.**

## New Rubber for Piping

Tuf-Flex, a special abrasive- and corrosive-resistant rubber compound, is developed by General Rubber Corp., Tenafly, N. Y. It is said to have given excellent results in the company's rubber expansion joints and pipe installations in systems handling abrasive or corrosive liquids, slurries, suspensions, and solids.



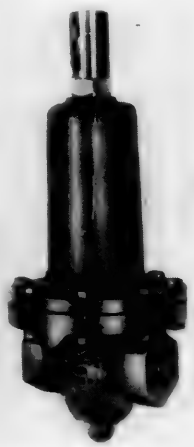
Although only a limited number of installations have been made in specific operations or industries, the results obtained to date have been highly encouraging, the company states. Flexing life has surpassed previously installed units, embrittlement and scale formation have not been observed, and wear has been surprisingly low.

Units made of the rubber compound are designed for use in pressure and vacuum systems handling abrasive or corrosive liquids, slurries, suspensions and solids in chemical, food, mining, nuclear, power, pulp and sewage operations. They are available in standard sizes from ½ to 72 inches I.D. with either duck and rubber or duck and neoprene integral full-faced flanges or new integral Gen-Lok ends. Covers of units can be furnished to resist corrosion, oils, heat and sunlight. Pipe is available in any length up to 50 ft.

**More information? Circle Item 36, postcard, last page.**

## Larger Reducing Valve

A reducing valve for initial pressures to 300 psi with gas, oil, or water is announced by Atlas Valve Co., Newark, N. J. Designated Fig. 1910, Type E, the valve, made of cast iron with bronze and steel trim, is a single diaphragm, single composition seat construction. It is said to have the largest capacity of any valve of its type and is available in six sizes, from ½ to 2 inches.



Outlet or regulated pressure spring ranges are 5-35, 20-60, and 40-90. Features announced are simplicity of servicing, silent operation, piston-balanced for accurate regulation, and single seating for dead end service. The valve also is made with a reverse seating arrangement to operate as a relief valve.

**More information? Circle Item 37, postcard, last page.**

## Packaged Air Conditioners

Three new packaged air conditioning units rated at 22, 25 and 30 tons are introduced by Air Conditioning Div., Westinghouse Electric Corp., Staunton, Va. These units expand the company's packaged air conditioner line for commercial applications to include eight models rated from 3 to 30 tons.

Major features of these new designs are application flexibility and compact size. The fan sections are shipped separately, permitting particular ease in handling and placing of the unit. This concept provides six different options for mounting the fan section, and means that any desired air flow pattern can be obtained, none of which require any field modification. All models, including the 30-ton design, will easily pass through 3-ft doorway.

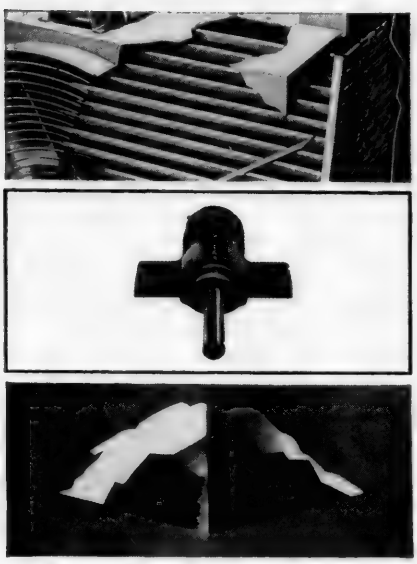
**More information? Circle Item 38, postcard, last page.**

*(Continued on page 122)*

SO HALSTEAD & MITCHELL ENGINEERS SAID . . .

# FOR LIKE-NEW PERFORMANCE YEAR AFTER YEAR— H&M COOLING TOWERS

**Halstead & Mitchell Cooling Towers give rated performance even after years of operation**



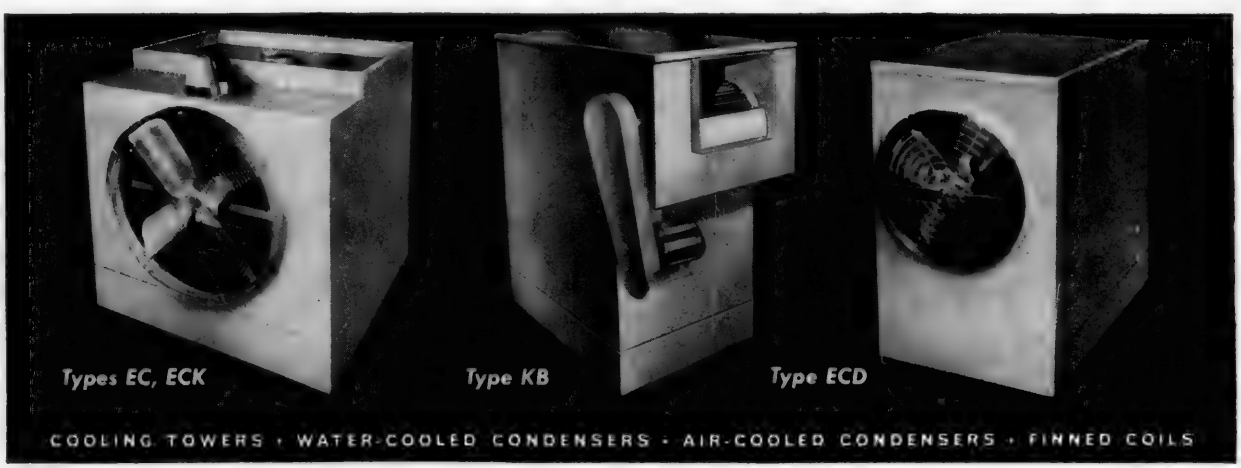
Special pressure creosoting of the wood fill prevents formation of fungus and algae which can build up and restrict the tower air flow, reducing system capacity. Only Halstead & Mitchell Cooling Towers carry a 20-Year Guarantee against failure due to fungus attack or rotting.

Sealed fan bearings are permanently lubricated, require no maintenance.

Tower housings are completely protected against corrosion by separate coatings of Vinsynite, Vinyl zinc chromate, and chlorinated rubber applied *after assembly*. Every edge, every corner is sealed against rust on all H&M Cooling Towers.

H&M Cooling Towers are available in propeller fan, centrifugal fan, belt drive, direct drive, and take-apart models. Capacities of 2 through 125 tons. For complete information contact your local distributor, or write to Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22, Pa.

HM Halstead & Mitchell




COOLING TOWERS • WATER-COOLED CONDENSERS • AIR-COOLED CONDENSERS • FINNED COILS

*(Continued from page 120)*

## Low-Speed Ventilators

Model CR, low-profile, low-speed centrifugal type roof ventilators are available from American Standard, American Blower Division, Detroit, Mich. The new line includes thirteen basic ventilator sizes with various motor and drive combinations resulting in 111 catalog sizes. Each size is sound-rated to suit specific building environments and provide a multiple selection of capacities and

quietness ratings for any type building requirements.

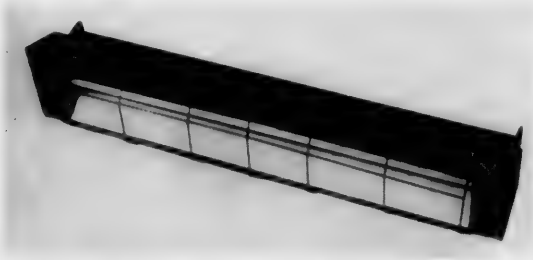
Capacities range from 1120 to 34,440 cfm at free delivery to 26,540 cfm at 1-inch w. g. static pressure. All units have been tested and rated in accordance with Standard Test Code for Centrifugal and Axial Fans adopted by the Air Moving and Conditioning Association, Inc., and carry the AMCA Certified Ratings Seal. Quiet and efficient performance is said to be assured by the construction of the ventilator wheel which has a true non-overloading power characteristic.

Ventilator in photo is seen with access door removed, showing accessibility of motor, drive, fan bearings, and safety disconnect switch for inspection or maintenance.

**More information? Circle Item 39, postcard, last page.**

## Infra-Red Heaters

Thermal-Raye electric infra-red heaters are announced by Thermal Aire, Inc., Boston (Allston), Mass. Units resemble fluorescent lighting fixtures, except that they contain a silica heating element said to be 98% transparent to infra-red radiation. Rays are directed by semi-parabolic reflectors.



According to the manufacturer, use of these heaters is a practical way to heat outdoor theaters, swimming pools, sidewalk cafes, garden restaurants, patios, subway and bus stations, loading platforms, sidewalk bank teller windows, gas stations, etc. Indoor applications include sprawling assembly plants, warehouses, lofts, churches, gymnasiums, etc.

Wattages range from 1600 to 3000, at 110, 208, and 230 volts. Units can be sprayed with ice water, while the lamp is burning, without cracking, the company states.

**More information? Circle Item 40, postcard, last page.**

## Glass Fiber Tank

A centrifugally molded glass fiber water conditioning tank is developed by Apex Reinforced Plastics, Cleveland, Ohio. Tank may be manufactured in a variety of diameters and capacities, and is said to offer weight savings over steel and alloys of up to 40%, with outstanding resistance to corrosion, chemical action and impact.

The company's centrifugal manufacturing process assures uniform wall thickness and finish, and eliminates longitudinal seams which could leak or rupture in service.

Tank end caps, available in a variety of shapes, are molded to the one-piece tank shell. According to the manufacturer, cycle life of the tank is practically infinite; test units have been cycled beyond 250,000. The tank will accommodate working pressures up to 700 psi.

The tank is available in a variety of standard colors, all permanently molded in. Standard pipe and tube fittings, both plastic and metal, can be supplied with the tank. Fittings also may be molded in.

**More information? Circle Item 41, postcard, last page.**

## Fiberglas Fresh Air Intakes

Fresh air and pressure relief intakes in reinforced Fiberglas are announced by The Gallaher Co., Omaha, Neb. Equipment will be identical in appearance with the company's recently announced Super/Air-Van line of power roof exhausters in reinforced Fiberglas.

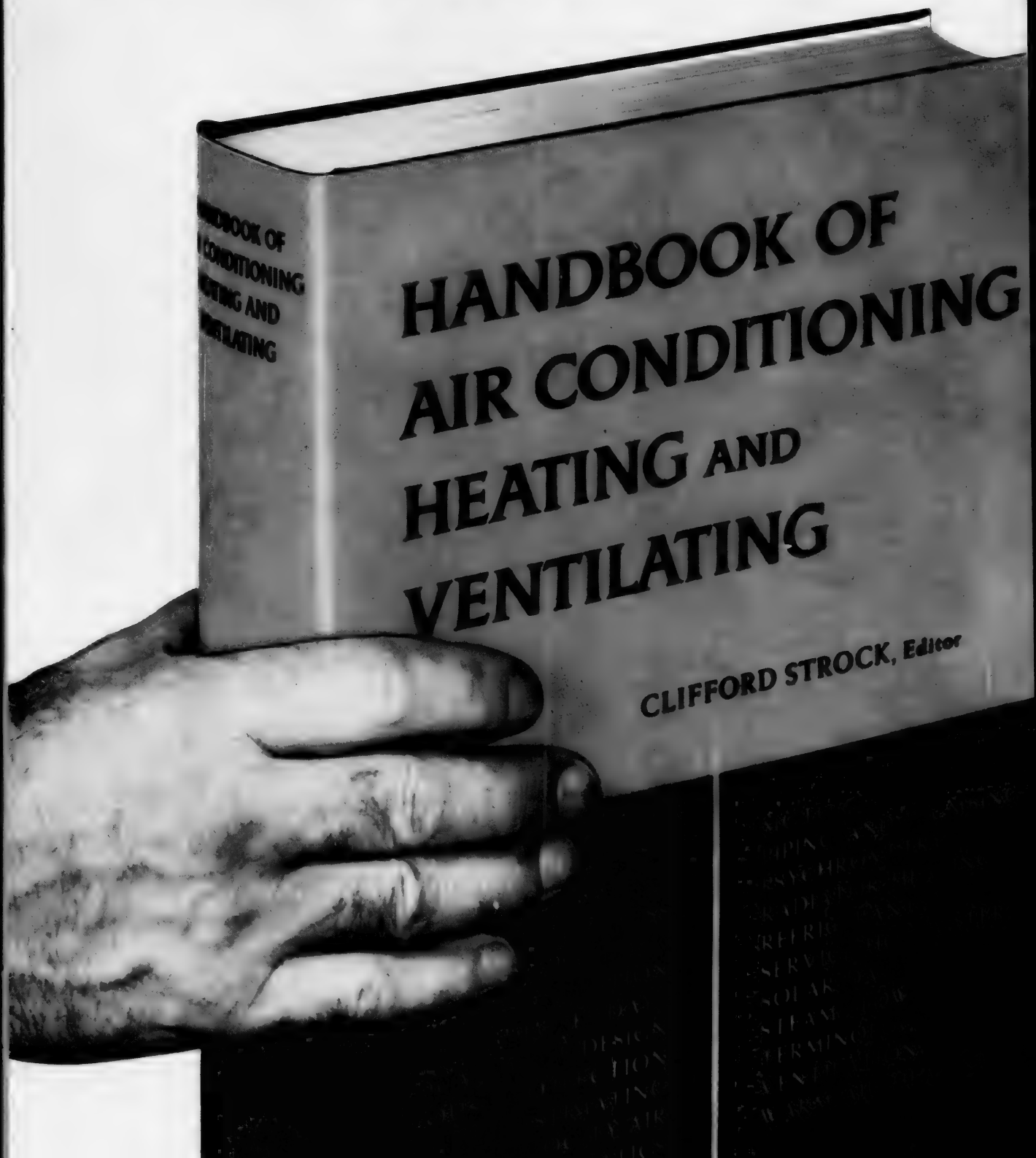
The company states that the chief advantage of the fresh air intakes will be the uniformity of appearance that can be achieved when used with the roof exhausters. The intakes can be ordered in any color. They never require maintenance or painting.

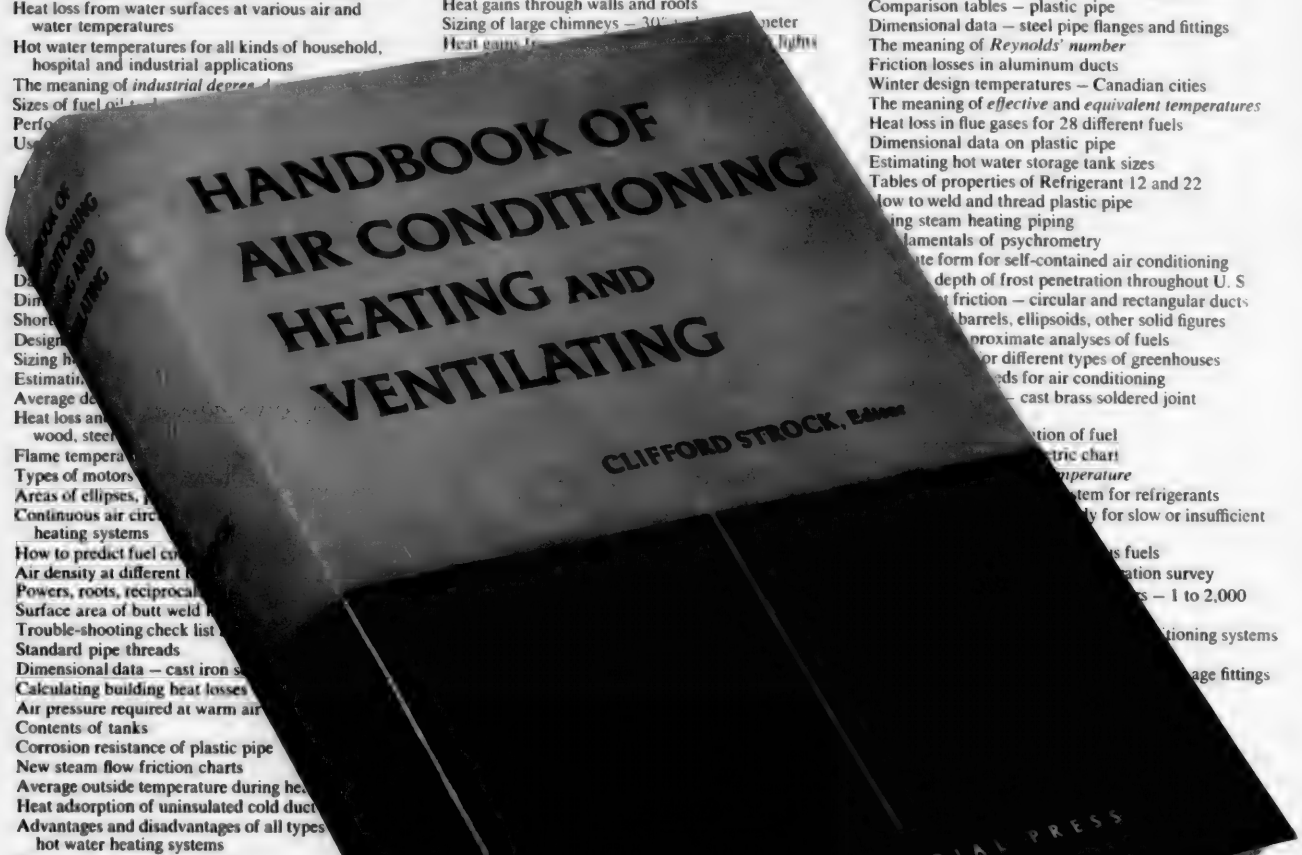
**More information? Circle Item 42, postcard, last page.**

*(Continued on page 127)*

# *Here it is!*

**READ DETAILS OF THIS GREAT NEW HANDBOOK ON NEXT THREE PAGES**






Estimating data for air conditioning
Dimensional data – wrought copper and bronze joints
Pounds of flue gases for perfect combustion for all kinds of fuels
Sizing refrigerant pipe lines
Heat gains from human beings
Insulation to prevent sweating on cold pipes
Normal yearly degree-days for 877 U. S. cities
How to use psychrometric tables
Blower sizes for warm air heating equipment
Estimating data for mechanical draft cooling towers
Heat loss from water surfaces at various air and water temperatures
Hot water temperatures for all kinds of household, hospital and industrial applications
The meaning of *industrial degree-d*
Sizes of fuel oil
Perfo
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Estimati
Average de
Heat loss an
wood, steel
Flame tempera
Types of motors
Areas of ellipses,
Continuous air circ
heating systems
How to predict fuel cx
Air density at different
Powers, roots, reciprocal
Surface area of butt weld
Trouble-shooting check list
Standard pipe threads
Dimensional data – cast iron s
Calculating building heat losses
Air pressure required at warm air
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Corrosion resistance of plastic pipe
New steam flow friction charts
Average outside temperature during he
Heat adsorption of uninsulated cold duct
Advantages and disadvantages of all types hot water heating systems
Estimating sewage quantities
Arithmetical and geometrical progressions
How to select hot water supply systems
Heat loss through unheated floor slab
Average degree-days by months and by yearly total for 42 Canadian cities
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Maximum depth of frost penetration throughout U. S.
Sizing exhaust mains at branch junctions
Pressure and temperature limits of plastic pipe
Dimensional data – malleable iron screwed fittings
Service hot water in hospitals
Tables of natural logarithms
Heat loss through insulated pipes – all pipe sizes, nine different *k* values
Calculating heat transfer by air by convection
Threshold, or maximum allowable limits of toxic gases and fluids
Frequency of occurrence of low temperatures in 120 U. S. cities
Conversion factors
Dimensional data – cast iron screwed fittings
Material for ducts handling corrosive gases
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Amount of ventilation air required
Demand on cold water piping systems and fixtures
Register temperatures in warm air heating
Type of bearings for a motor used for a belt drive
Performance and application data – axial flow fans
Dimensional data – brass and bronze flanged fittings
The meaning of *adsorption*
Best type of motor to use for a hot water pump
Heat loss from copper tubing
High temperature psychrometric chart to 1500 deg
Step-by-step procedure in duct design
Cooling degree-days – a degree-day unit for estimating summer air conditioning needs
Equivalent resistance of valves and fittings in terms of lengths of straight pipe
Required air volume in a heating or cooling system
Psychrometric chart applicable to barometric pressures to 8,000 ft. above from 8,000 ft. below sea level
Short-cut preliminary cooling estimates
How to use a slide rule
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How to test exhaust ventilating systems
Effect of enclosures on radiator heat transmission
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Heat gains through walls and roofs
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Heat gains
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Chemistry of combustion
The meaning of *apparatus dew point*
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Laying lengths of pipe with screwed fittings
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Angles of sliding for various coals
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Friction losses in aluminum ducts
Winter design temperatures – Canadian cities
The meaning of *effective* and *equivalent temperatures*
Heat loss in flue gases for 28 different fuels
Dimensional data on plastic pipe
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Tables of properties of Refrigerant 12 and 22
low to weld and thread plastic pipe
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damentals of psychrometry
te form for self-contained air conditioning
depth of frost penetration throughout U. S
friction – circular and rectangular ducts
barrels, ellipsoids, other solid figures
proximate analyses of fuels
or different types of greenhouses
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– cast brass soldered joint
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age fittings
ipe
tings
phase motors
per foot of pipe
method of combustion calculation
ferences between capacitor and split-phase motors
Number of hours an intermittent automatic heating plant operates in a normal year.
Draft required for burning coal
Heat loss from steam piping – pounds of steam per hour
Winter design temperatures – 220 U. S. cities
Friction losses in duct elbows and fittings
Cold water requirements for homes, buildings, theaters, restaurants, etc.
Solutions of equations
Heat loss through heated floor slabs
The meaning of *eupatheoscope*
Air conditioning equipment maintenance schedule
Mixing of hot and cold water
Maximum attainable draft per foot of chimney
Ignition temperature of fuels
Radiation from warm surfaces to cold ones
Color codes for pipe lines
The meaning of *pH*
Standard drafting room symbols for air conditioning, heating, ventilating, valves, piping and plumbing
What the flue gas analysis means
Water requirements for various domestic animals
Graphs to determine apparatus dew point
Balancing air flow in air conditioning systems
Preventing spontaneous combustion in coal piles
Heat gains from gas and electrical appliances
The meaning of *decibel*

# A Comprehensive Handbook Made for *Your* Needs *Today!*

AFTER YEARS of painstaking preparation, the new *HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING* is ready – a big, completely new book that has been designed to give you the kind of information you need and use almost daily . . . and to present it in the most convenient, time-saving manner.

It's a big book! The large 7¾" x 10¾" page size makes text, tables and other data easy to read; and – most important – permits the use of large-scale charts from which you can obtain accurate results directly. Tables also are set in large, easy-to-read type. You'll save hours of time with these features alone! Throughout the book, care and thought have been given to the best manner in which to present the information so that it will be most useful . . . most convenient . . . most understandable. Charts, tables, graphs, maps, illustrations are used on almost every page – over a thousand of them appear in this 1,094-page book – and explanatory text has been kept to a minimum.

*THE HANDBOOK* covers all the major areas of air conditioning, heating, ventilating and related functions. It is divided into eight main sections, each of which is indexed separately. These eight sections are:

1. Air Conditioning
2. Air Handling and Ventilation
3. Fuels and Combustion
4. Heating and Heat Transfer
5. Piping and Plumbing
6. Motors and Motor Starters
7. Mathematical Data and Drafting Room Symbols
8. Terminology

In addition, a complete cross-index enables you to locate any item of information quickly, even though you are not sure under which category it would fall.

At the left is a partial list of typical subjects covered – literally thousands of facts, all quickly, easily accessible in one convenient volume.

### FACTS FROM THE FIELD'S FOREMOST AUTHORITIES

To obtain such a wealth of material on such a variety of subjects, the experience of experts in every field has been drawn upon. Well-known authorities have contributed their knowledge, as well as the results of their costly research and special studies. All this information, plus a great deal of his own original work, has been coordinated by Clifford Strock, Editor of AIR CONDITIONING, HEATING AND VENTILATING. His unique combination of experience both in the field and behind the editor's desk gives him the knowledge and judgment to know what to select, what to reject, and how to present the data in the most convenient, most usable manner.

### PAGE AFTER PAGE OF INFORMATION NEVER BEFORE PUBLISHED

Page after page of tables, charts, graphs and maps in *THE HANDBOOK* present data never before available in such convenient form. For example, complete data on heat loss from insulated pipe are given in terms of nine different *k* values, rather than in terms of just one standard type of insulation. A complete range of pipe sizes is covered in these tables, so that knowing the pipe size and the *k* value of the insulation you can obtain a direct answer that does not require conversion from one type of insulation to another.

Another example: tables giving heat loss through glass as well as by infiltration are given for every standard type and size of wood, steel and aluminum window, weatherstripped and non-weatherstripped. Drawings illustrate the construction features of each window, enabling you to locate the data you need about a particular type quickly.

*THE HANDBOOK* includes degree-day data, in both tabular and map form, for 1,228 localities in the U. S., including Alaska, as well as 42 cities in Canada, plus a comprehensive discussion of the ways in which you can use this information.

In addition to the degree-day maps, the most complete collection of climatic maps ever published in this field give other essential data such as design temperatures; sunshine; humidity; snow; number of hours that temperatures reach 80, 85 and 90 deg.; year-round sun angles for various latitudes, etc. Here again, the large page size of *THE HANDBOOK* makes these maps easy to interpret.

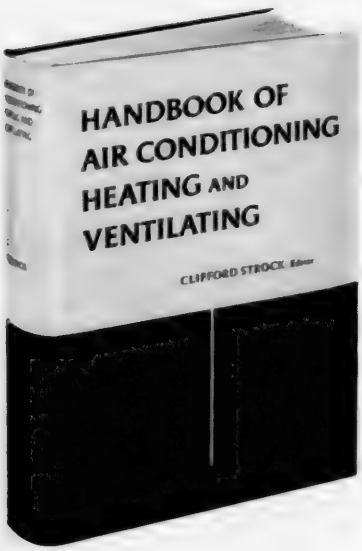
There are but a few examples of the kind of information you will find in the *HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING* – practical, clear, useful data that will save you hours of costly time . . . insure money-saving accuracy in your calculations.

The questions that come up in your work are becoming more complex, more numerous every day. Only a handbook that is completely new that has been edited with *your needs today* in mind, can give you the answers to many of these questions. See for yourself how many ways you will be able to put *THE HANDBOOK* to work for you.

*THE HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING* will become the *most used book* that you own. Start putting it to use now!

**READ MORE DETAILS ABOUT THE HANDBOOK ON THE NEXT PAGE**

# *You'll Use Your HANDBOOK Dozens of Times a Day to Find Information on All These Subjects*

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**598 Charts, Maps and Illustrations**
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### TERMINOLOGY

Definitions of 482 terms used in air conditioning, heating, ventilating, piping, plumbing, etc.

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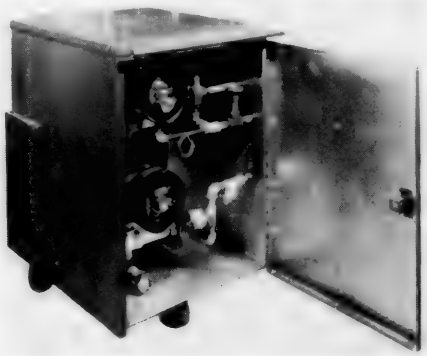
*(Continued from page 122)*

## Electric Steam Generator

Jetsteam, an instantaneous, portable, electric steam generator, is available from Tejax Engineering Corp., Pawtucket, R.I. It produces dry steam for industrial process use; for heating industrial, domestic, and farm installations; for cleaning of equipment, buildings, spare parts, motors, etc.; for stripping of paint, plastic film,



and grease; and for sterilizing equipment for food and pharmaceutical uses.

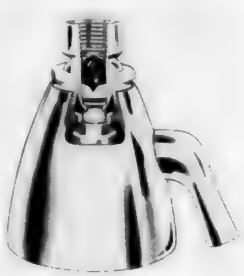
Heart of the assembly is an electric heating element made of heavy gage 80% nickel-20% chromium alloy. Design assures maximum pressure within 5 min, the company states, with field-tested controls guaranteeing automatic operation and adequate safety protection. Its portability eliminates heat otherwise wasted in long steam lines.

Cabinet is 19 by 19 by 36 inches; maximum steam pressure, 100 psig; electrical rating is 10 kw, 220 v. single phase.

**More information? Circle Item 43, postcard, last page.**

## Automatic Water Flow Control

Needless waste of water from shower heads and other fixtures can be minimized with a new water flow control, according to the manufacturer, Speakman Co., Wilmington, Del.



Called Autoflo, it is installed right in the water line and conserves water, cuts water heating costs, and lowers water usage by controlling flow from showers to a maximum of 4½ gpm, despite line pressures up to 150 psi. Designed mainly for use in multiple water fixture installations such as schools, hotels, motels, factories and institutions, the control also brings substantial economies to homeowners.

This principle of controlled water flow utilizes a specially-designed orifice assembly within the company's Anystream shower head, a faucet or a water line, to control the flow of high pressure water. Passing through the orifice, the water automatically emerges from the fixture at a constantly controlled flow rate, regardless of pressure variations in the water line, the company reports.

Water control can be obtained as an integral component of Anystream shower heads and other company fixtures, or as a conversion unit for existing showers and faucets.

**More information? Circle Item 44, postcard, last page.**

## Oil-Fired Furnaces

An all-purpose line of Shafconaire oil-fired furnaces for commercial and industrial use is announced by Overhead Heaters, Inc., Detroit, Mich.

These oil-fired units are designed to meet all the size and output requirements of shopping centers and other types of buildings requiring various capacity units. According to the manufacturer, the versatile furnaces save installation space because they are the most compact units of all equal ratings on the market.

Available in models ranging from 85,000 to 252,000 Btu per hr output, the furnaces have a built-in, stainless steel combustion chamber for long life and maximum efficiency. In addition, they are fully approved for minimum reduced clearance from combustible materials, and can be quickly and easily adapted in the field for eight right or left hand installations.

**More information? Circle Item 45, postcard, last page**

## Precision Pressure Switch

A precision pressure switch capable of extremely accurate and sensitive response is developed by Meriam Instrument Co., Cleveland, Ohio. Consisting of a contactor manometer and a relay-power-supply package (tradenamed Manotac), unit may be used for either or both alarm signalling and control in applications involving pressure, vacuum, differential pressure, flow and liquid level.

The use of a special indicating fluid (specific gravity equals 1) is said to give a make-or-break control sensitivity of 0.005 inches of water. The instrument can sense pressure increments as small as 0.003 oz per sq in. with complete dependability, the company states.

**More information? Circle Item 46, postcard, last page.**

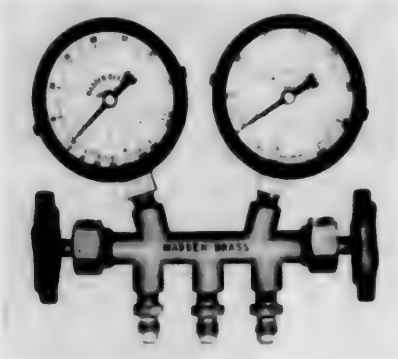
*(Continued on page 128)*

*(Continued from page 127)*

## Charging and Testing Unit

A newly designed double gage charging and testing unit is announced by the Madden Brass Products Company, Aurora, Ill.

This compact charging, purging and testing unit features an all-brass forged body, easy-grip handles, and Teflon seat for positive shut-off without stress and strain.



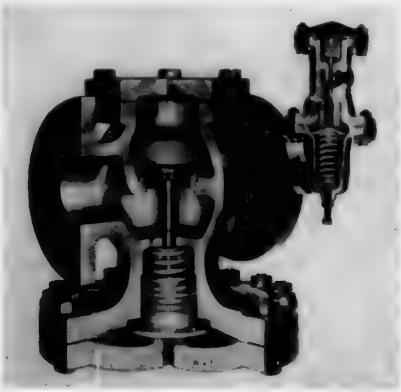
Seat is replaceable, thereby prolonging life of unit. Three ¼-inch SAE flare connections enable unit to be used with company's color-coded charging lines, thereby eliminating line tracing by servicemen.

Also available is the company's hose holder. This may be attached to back of unit so hoses or charging lines, can be hooked on when not in use, keeping them clean and dry.

**More information? Circle Item 47, postcard, last page.**

## Steam Pressure Regulators

Kieley & Mueller, Inc., Middletown, N. Y., announce a line of external-pilot steam pressure regulators that are said to provide greater capacity per valve size, and accurate, fast-response regulation. Suitable for continuous or intermittent duty, the regulator incorporates an integral bleed orifice which eliminates one interconnecting pipe line usually required on pilot-operated regulators of this type.



Called Type 471, the regulator is capable of large pressure reductions and the light, dead-end shut-off necessary for batch-type apparatus such as sterilizers, vats, kilns, presses and ovens. Positive shut-off is accomplished by a single-seat valve arrangement which employs stainless steel valve discs and seat rings.

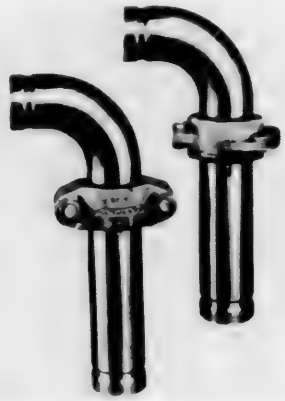
The regulator consists of a main valve that will handle maximum pressures of 125 or 250 psi, and an external pilot valve. If the main valve must be inconveniently located, the pilot can be remotely installed in an accessible location where quick pressure adjustments are easily made.

**More information? Circle Item 48, postcard, last page.**

## Stainless Pipe Fittings

A line of Schedule 5 and 10 roll grooved stainless steel pipe fittings, introduced by Victaulic Company of America, Elizabeth, N. J., for installation with Victaulic couplings, makes possible a complete quick-coupled, all-stainless steel piping system. The company has announced the line as the first in a series of new fittings that will permit integrated quick-coupled systems in a wide range of piping materials.

Stainless steel elbows, tees, crosses, returns, stub and



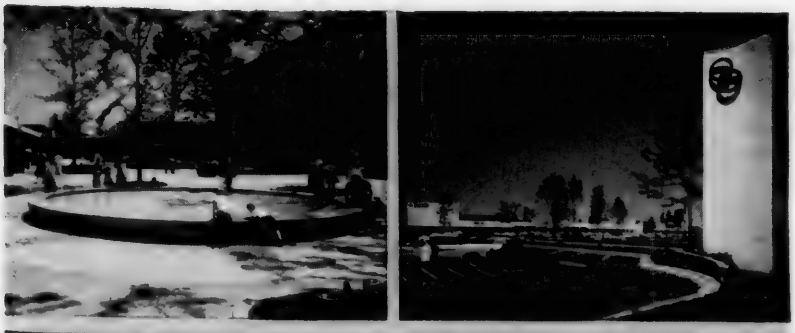
blank ends, reducers, and reducing tees, with roll-grooved ends, are available from stock in sizes that range from 1¼ to 4 inches in diameter. Additional sizes of fittings can be promptly produced on order.

According to the manufacturer, fittings will reduce by half the cost of joining Schedule 5 and 10 stainless steel piping when compared to welding or flanging. In addition, the availability of fittings in Schedule 5 will permit the use of this light-schedule material in cases where heavier Schedule 10 piping was used only because of its easier welding characteristics and not because the extra strength was required.

The company's method of joining utilizes a pressure-sensitive gasket that bridges the pipe ends, and a housing that fits snugly into circumferential grooves in the piping. The coupling is made tight with two bolts, or a specially designed toggle that opens or closes by hand, in one operation, without the use of any tool.

**More information? Circle Item 49, postcard, last page.**

*(Concluded on page 130)*



OLD ORCHARD SHOPPING CENTER, Skokie, Ill.

Architects: **LOEBL, SCHLOSSMAN & BENNETT,** Chicago, Ill.
Mechanical Engineer: **ROBERT E. HATTIS, INC.,** Chicago

(D2)

# POWERS

## Air Conditioning Control HELPS MAKE SALES in Leading Shopping Centers

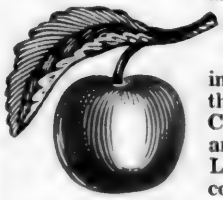
**It's a Pleasure to Shop** in air conditioned stores equipped with Powers comfort control. Shoppers spend more freely and owners spend less for maintenance. Some prominent users of Powers temperature control are listed below:

**Northland Shopping Center,** near St. Louis
**Gulfgate Shopping Center,** near Houston
**7-Corners Shopping Center,** near Washington, D. C.
**Macy's at Roosevelt Field Shopping Center,** N. Y.
**Famous-Barr Stores,** St. Louis
**Gimbels,** in Cheltenham and Philadelphia
**I. Magnin & Company,** Los Angeles
**Nieman-Marcus Co.,** Dallas
**Rich's,** Atlanta, Georgia
**Sakowitz Bros.,** Houston
**Saks Fifth Ave.,** New York – White Plains
**Sears,** "World's largest store", many large stores in U. S. and Latin America
**John Wanamaker Stores** in Wynnewood, Pa., Baederwood, Pa., and Wilmington, Del.
In CANADA: **T. Eaton Co., Ltd.,** 6 stores
**Simpson-Sears,** 12 Stores • **Robert Simpson Co., Ltd.**
**Dupuis Freres,** Montreal

### At Old Orchard Shopping Center

Powers control is used in —

Marshall Field & Co.



**CRAB APPLE RESTAURANT**

in the Sun Room, the Apple Basket, Countryman's Grill and in the deluxe Le Manoir, with its continental cuisine.

Also in the following stores: THE FAIR • HIRSCH • ARCADE SHOPS • JOHN M. SMYTH CO. In the 7 story PROFESSIONAL BUILDING conditioned air for the interior zones is controlled by Powers.

**For Your New Building,** be it a school, factory, hospital, church or commercial building ask your architect or engineer to include a Powers Quality system of temperature and humidity control. Its dependable year after year operation and low maintenance cost make it a highly profitable investment.

## THE POWERS REGULATOR CO.

SKOKIE, ILL. | *Offices in 85 cities in U.S.A. and Canada* | *See your Phone Book*

**Automatic Temperature and Humidity Control Since 1891**

*(Concluded from page 128)*

## Air Cooled Equipment

Remote air cooled air conditioning equipment is being offered to manufacturers on an O.E.M. basis by Southwest Mfg. Co., Aurora, Mo.

Its remote condensers have been well received by the trade since being introduced at the 1957 Heating and Ventilating Exposition in Chicago, the company states. The large curved condenser with vertical hot air discharge is said to lower head pressures and operating costs, due to the larger finned area per ton capacity.

Five models are available, ranging from 2 through 7½ hp with a wide selection of cooling coil assemblies for forced air furnaces and air handling units. In addition the company will manufacture equipment designed by others or will provide expert design service for those wishing to market exclusive products in the air conditioning field.

**More information? Circle Item 50, postcard, last page.**

## Helical Finned Tubes

A 6-inch finned tube, announced by The Griscom-Russell Co., Massillon, Ohio, extends the tube size range available in the company's heat transfer equipment by more than 50%. The fins, which can increase heat transfer surface up to ten times the bare tube area, range in height from ¾ to 1¼ inches for the new 6-inch IPS size. At the other end of the scale, the smallest tube, with a pencil-size 3/16-inch OD (also shown in photo) is available with fins 3/32 inches in height.

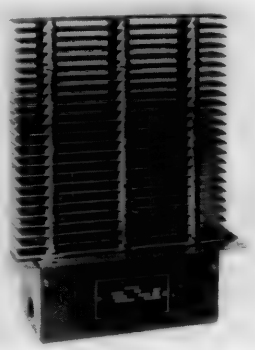
Finned tubes are available to withstand pressures up to 5000 psi and temperatures up to 1150 deg F, depending on materials used. Fin and tube materials include steel, copper, aluminum, admiralty, Monel and Cu-Ni, stainless and chrome-moly steels. Precoiled fins are wound under tension into grooves on the tube to provide a strong mechanical bond.

The helical finned tubes are suitable for use in heat exchangers for air and gas inter- or after-cooling, pipeline heating, fuel preheaters, chemical vapor condensing, exhaust steam condensing, and heating or cooling air or other liquids.

**More information? Circle Item 51, postcard, last page.**

## Electric Insert Duct Heater

Announced by Electromode Div., Commercial Controls Corp., Rochester, N. Y., is the Electromode electric insert duct heater, a unit ready for installation and completely wired for connection to the proper power system. It is specifically designed for use with package air conditioning units and other similar applications. Inasmuch as these heaters operate in an air stream, the advantages of both the cleanliness and the safety of electric heat are apparent, according to the company.



The duct heater consists primarily of the company's Safety Grid heating element, mounted on the heater outlet box. This outlet box is constructed of heavy gage formed steel. It is corrosion treated and finished in baked-on gray enamel. A removable cover provides easy access to the terminals.

Insert duct heaters are made in two models: DH-3 with a capacity of 3 kw and DH-5 with a capacity of 5 kw, and operate on 240 volts, single or 3 phase. Heater may be installed in existing equipment and ducts by fitting into a rectangular opening in side or bottom. There is no need to rebuild duct to fit a special framework.

**More information? Circle Item 52, postcard, last page.**

## Fuel Oil Treatment

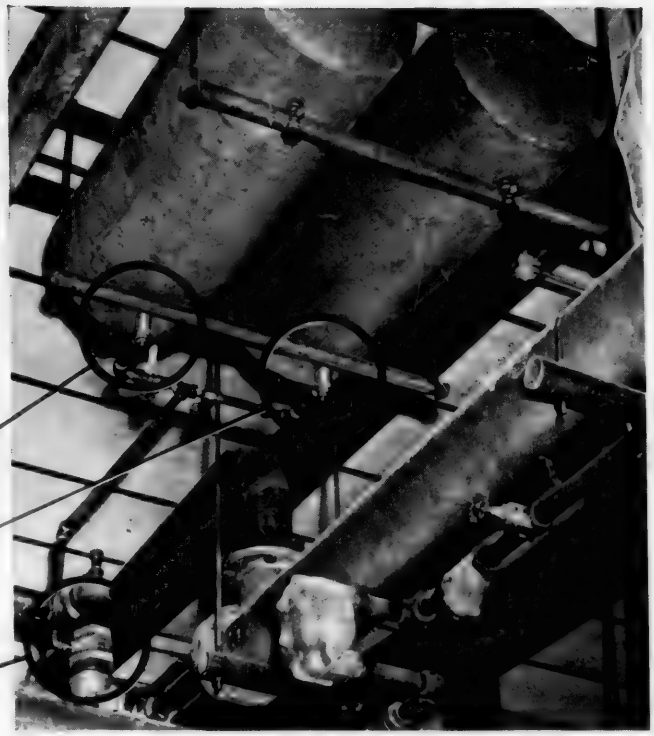
Bird-Archer Co., Philadelphia, Pa., announces a fuel oil treatment designated Formula C-8. This formula, according to the manufacturer, combines a very effective fuel oil treatment with a soot remover.

Now, the company reports, power engineers can simply burn the soot and discharge it to atmosphere instead of having to shut down while they dig out the soot and dispose of it. The savings in manpower and down-time are said to be considerable. Formula C-8 is a blend of organic solvents for sludge dispersion, an emulsifying agent to handle water contamination in storage tanks, plus a material to lower the ignition point of soot present on boiler heating surfaces. This permits soot to be readily ignited at normal furnace temperatures.

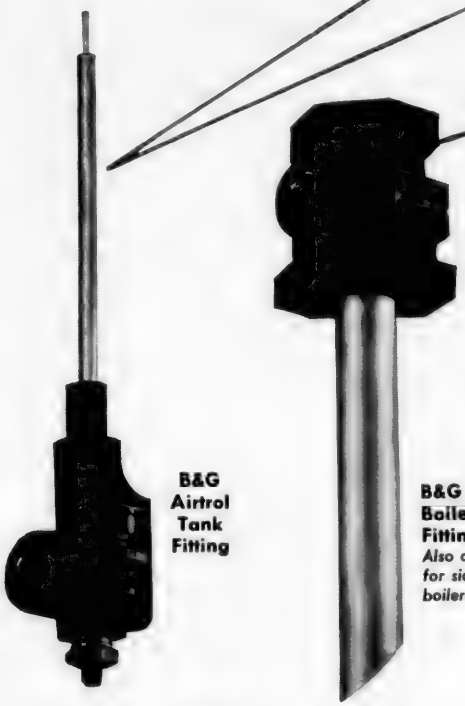
**More information? Circle Item 53, postcard, last page.**

# B&G
# AIRTROL® SYSTEM
## *ELIMINATES* AUTOMATIC AIR VENTS!

### GUARANTEED TO END AIR TROUBLES—*FOREVER*

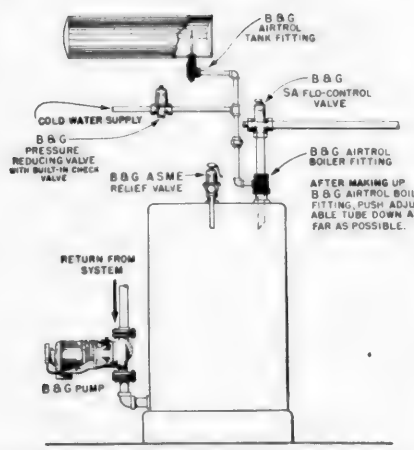


*Installation of B&G Airtrol System where B&G Type "SU" steam convertor is used to heat water for a forced circulation hot water heating system.*



**B&G Airtrol Tank Fitting**

**B&G Airtrol Boiler Fitting**
*Also available for side outlet boilers.*


B&G AIRTROL TANK FITTING
B&G SA FLO-CONTROL VALVE
COLD WATER SUPPLY
B&G PRESSURE REDUCING VALVE WITH BUILT-IN CHECK VALVE
B&G ASME RELIEF VALVE
B&G AIRTROL BOILER FITTING
AFTER MAKING UP B&G AIRTROL BOILER FITTING, PUSH ADJUSTABLE TUBE DOWN AS FAR AS POSSIBLE.
RETURN FROM SYSTEM
B&G PUMP

**B&G Airtrol System installed on top outlet boiler**

It is essential to trouble-free operation that a forced hot water heating system be *tightly closed and air-free!*

If an otherwise tight system has *one or more automatic air vents, it is no longer a closed system!* Any air which is vented is lost from the compression tank, resulting in a water-logged tank.

The B&G Airtrol System ends the troubles which may be caused by automatic air vents. When properly installed, the Airtrol System is *guaranteed* to prevent water-logged compression tanks, air-bound radiation and gurgling pipes...and eliminates profitless call-backs.

The Airtrol System is simplicity itself, consisting of two easily installed parts—the Boiler Fitting and the Tank Fitting. Their combined function is to trap air in the compression tank and prevent its return to the boiler, piping and heat distributing units. All air bubbles are caught where they form ...in the boiler.

### GUARANTEE

**"B&G" Airtrol Systems are guaranteed to prevent the accumulation of air in heating units and prevent noises caused by entrained air in the piping. In case of the failure of any B&G Airtrol System (within the U.S.A.) to operate correctly, when installed in accordance with our published instructions, we will provide, free of charge, the services of a factory-trained engineer who will supervise the changes required to produce guaranteed satisfactory results.**

## BELL & GOSSETT COMPANY

Reg. U.S. Pat. Off.

**Dept. FO-4, Morton Grove, Illinois**

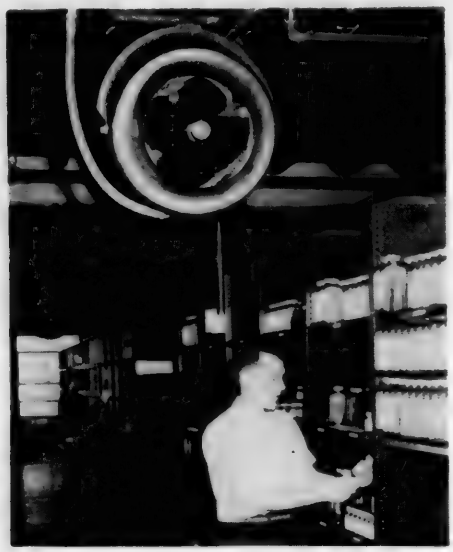
*Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario*

# PRODUCT APPLICATIONS

## New, Unusual, or Ingenious Uses of Equipment and Materials

### Heating Problem Solved for Manufacturer With Electric Space Heaters

When increased business required new manufacturing warehouse and shipping facilities, S. E. Massengill Co., manufacturer of pharmaceutical supplies at Bristol, Tenn., found itself with a heating plant already operating at capacity. Heating requirements for the building were easily met with electric space heaters.



One hundred General Electric heaters were installed in the building and located next to outside walls. The space-saving units circulate air continuously around the edge of the building. Air swirls to the center giving even heat throughout the whole area. Low maintenance and power rates were economical factors considered in deciding to use electric heat in this form, according to Massengill officials.

### Miniature Pilot Valves Operate Large Water Softener System

Four miniature pilot valves provide finger-tip control of the water-softener system for the largest central heating and refrigerating plant west of the Mississippi.

Designed and installed by Water Conditioning, Inc., San Gabriel, Calif., the four-unit system supplies the entire hot water and boiler-feed requirements for the county buildings in the Los Angeles Civic Center, which includes the Los Angeles Hall of Records, the Hall of Justice, the County Administration Building, and a number of other major administrative buildings. Capacity of the softener system is 1500 gpm, or almost 2-million gal each day.

Once every two days, each of the softener units must be taken out of service and put through a regeneration cycle. The ion-exchange resins are backwashed, treated with a brine solution, and thoroughly rinsed. Six separate valves, ranging in size from 4 to 1½ inches, control these operations. All six valves are, in turn, operated by a single remote-control pilot valve. By simply turning a small dial indicator, Civic Center employees may switch the unit to any phase of the regeneration cycle.

The valves and pilot controls are the product of Automatic Valve Systems Co., Newport Beach, Calif. The valves are hydraulically activated, opening and closing in response to water pressure transmitted from the pilot control through small metal tubes. When pressure is applied to the valve, it pushes against an enclosed diaphragm, closing off the valve. When control pressure is reduced, line pressure lifts the diaphragm, opening the valve to full flow.

### Rack-Mounted Water Coolers Solve Maintenance Problem

A problem that often confronts building managers and maintenance men is how to do a quick yet thorough job of cleaning around water coolers. This problem is accentuated by the necessity of keeping cooler areas clean to maintain proper sanitation standards.

When the 28-floor Murchison Tower building, in Denver, Colo., is completed, it will incorporate an interesting solution to this maintenance-sanitation problem.

Water coolers in the Murchison Tower building are to be mounted on racks and suspended from the walls. This will allow ample clearance underneath the coolers for mopping and other clean-up operations.

Coolers, made by Cordley & Hayes, New York, N. Y., will be hung nine inches off the floor. Each cooler will be supported from the wall by a heavy gage steel rack, also made by the company. Racks are being secured to the walls with toggle bolts. Altogether there will be 150 coolers in the building when fully occupied.

# Skidmore Pumps

## Here are the answers to— your Heating Pump Problems

**NEW!**

**CLOSE-COUPLED**

**CCVS**

Here's the NEW Skidmore CCVS Vertical Pump — offering a new high pump efficiency — yet with a minimum motor size. Featuring new close coupled design and mechanical shaft-seal . . . complete pump and motor unit is bolted to receiver . . . in sizes for all installations: Three new single units and two duplex units . . . can be installed on floor level or in pit. Write for your copy of new bulletin No. 21-C which fully describes these new, rugged, compact CCVS Skidmore Pumps.

This NEW single unit above has a 6000 sq. ft. EDR with 10 gallon receiver

*CHOOSE WITH CONFIDENCE*

SKIDMORE CORPORATION • ST. JOSEPH, MICHIGAN

# DEGREE-DAYS FOR NOVEMBER, 1958

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 31st Year of Publication of Monthly Degree-Day Data

| City | November | | | Season to Nov. 30, incl., from Sept. 1 | | |
|---|---|---|---|---|---|---|
| | 1958 | 1957 | Normal | 1958 | 1957 | Normal |
| Abilene, Texas (A) | 319 | 487 | 350 | 458 | 634 | 503 |
| Albany, New York (A) | 745 | 691 | 780 | 1386 | 1293 | 1362 |
| Albuquerque, New Mexico (A) | 562 | 739 | 630 | 846 | 1012 | 858 |
| Alpena, Michigan (C) | 793 | 815 | 864 | 1456 | 1625 | 1609 |
| Asheville, North Carolina (C) | 449 | 509 | 552 | 782 | 967 | 864 |
| Atlanta, Georgia (A) | 270 | 335 | 393 | 385 | 578 | 511 |
| Atlantic City, New Jersey (A) | 510 | 427 | 507 | 873 | 725 | 766 |
| Augusta, Georgia (A) | 239 | 284 | 282 | 374 | 471 | 341 |
| Baltimore, Maryland (C) | 466 | 419 | 489 | 713 | 685 | 725 |
| Billings, Montana (A) | 848 | 916 | 876 | 1414 | 1727 | 1557 |
| Binghamton, New York (C) | 714 | 674 | 735 | 1329 | 1294 | 1304 |
| Birmingham, Alabama (A) | 319 | 344 | 396 | 426 | 585 | 532 |
| Bismarck, North Dakota (A) | 1066 | 1012 | 1098 | 1786 | 1881 | 3458 |
| Block Island, Rhode Island (A) | 535 | 874 | 591 | 990 | 874 | 1009 |
| Boise, Idaho (A) | 735 | 850 | 762 | 1177 | 1385 | 1286 |
| Boston, Massachusetts (A) | 547 | 529 | 618 | 1017 | 903 | 1010 |
| Buffalo, New York (A) | 687 | 717 | 753 | 1207 | 1313 | 1308 |
| Burlington, Iowa (A) | 664 | 783 | 765 | 1034 | 1287 | 1184 |
| Burlington, Vermont (A) | 810 | 764 | 858 | 1544 | 1436 | 1551 |
| Cairo, Illinois (C) | 428 | 501 | 492 | 602 | 734 | 681 |
| Charleston, South Carolina (C) | 114 | 180 | 214 | 180 | 272 | 248 |
| Charlotte, North Carolina (A) | 331 | 351 | 438 | 511 | 627 | 592 |
| Chattanooga, Tennessee (A) | 403 | 429 | 477 | 585 | 717 | 670 |
| Cheyenne, Wyoming (A) | 849 | 1049 | 897 | 1519 | 1886 | 1715 |
| Chicago, Illinois (A) | 659 | 736 | 765 | 981 | 1222 | 1205 |
| Cincinnati, Ohio (C) | 474 | 543 | 567 | 710 | 865 | 831 |
| Cleveland, Ohio (A) | 608 | 657 | 679 | 1010 | 1156 | 1114 |
| Columbia, Missouri (A) | 516 | 687 | 654 | 788 | 1055 | 978 |
| Columbia, South Carolina (A) | 249 | 287 | 308 | 400 | 467 | 384 |
| Columbus, Ohio (C) | 593 | 627 | 654 | 954 | 1071 | 1012 |
| Concord, New Hampshire (A) | 811 | 714 | 849 | 1537 | 1363 | 1553 |
| Concordia, Kansas (C) | 585 | 769 | 687 | 871 | 1163 | 1019 |
| Dallas, Texas (A) | 225 | 371 | 299 | 303 | 498 | 352 |
| Dayton, Ohio (A) | 639 | 689 | 693 | 1031 | 1176 | 1090 |
| Denver, Colorado (A) | 724 | 838 | 771 | 1172 | 1399 | 1316 |
| Des Moines, Iowa (A) | 694 | 877 | 798 | 1075 | 1439 | 1252 |
| Detroit, Michigan (A) | 657 | 713 | 747 | 1078 | 1275 | 1224 |
| Devils Lake, North Dakota (C) | 1167 | 1134 | 1197 | 2005 | 2129 | 2127 |
| Dodge City, Kansas (A) | 623 | 757 | 669 | 911 | 1148 | 971 |
| Dubuque, Iowa (A) | 805 | 911 | 882 | 1284 | 1601 | 1475 |
| Duluth, Minnesota (C) | 1070 | 1094 | 1092 | 1952 | 2120 | 1983 |
| Elkins, West Virginia (A) | 674 | 683 | 726 | 1251 | 1346 | 1260 |
| El Paso, Texas (A) | 243 | 476 | 390 | 379 | 603 | 460 |
| Ely, Nevada (A) | 903 | 1072 | 894 | 1663 | 1983 | 1683 |
| Escanaba, Michigan (C) | 848 | 900 | 933 | 1549 | 1753 | 1735 |
| Evansville, Indiana (A) | 529 | 615 | 570 | 824 | 976 | 844 |
| Fargo, North Dakota (A) | 1054 | 1074 | 1122 | 1722 | 1916 | 1923 |
| Fort Smith, Arkansas (A) | 361 | 462 | 437 | 515 | 659 | 575 |
| Fort Wayne, Indiana (A) | 691 | 754 | 759 | 1140 | 1361 | 1243 |
| Fort Worth, Texas (A) | 247 | 402 | 299 | 329 | 546 | 357 |
| Fresno, California (A) | 313 | 386 | 345 | 336 | 465 | 431 |
| Galveston, Texas (C) | 102 | 145 | 131 | 137 | 194 | 131 |
| Grand Junction, Colorado (A) | 726 | 854 | 792 | 1066 | 1249 | 1161 |
| Grand Rapids, Michigan (A) | 722 | 792 | 822 | 1247 | 1499 | 1428 |
| Green Bay, Wisconsin (A) | 856 | 912 | 945 | 1487 | 1761 | 1643 |
| Greensboro, North Carolina (A) | 424 | 448 | 510 | 698 | 824 | 741 |
| Greenville, South Carolina (A) | 286 | 368 | 411 | 452 | 645 | 552 |
| Harrisburg, Pennsylvania (A) | 596 | 593 | 630 | 994 | 1045 | 1007 |
| Hartford, Connecticut (A) | 662 | 596 | 699 | 1258 | 1143 | 1184 |
| Havre, Montana (C) | 1017 | 925 | 1023 | 1755 | 1882 | 1857 |
| Helena, Montana (A) | 1018 | 976 | 999 | 1842 | 1978 | 1936 |
| Houston, Texas (C) | 133 | 175 | 162 | 181 | 246 | 162 |
| Huron, South Dakota (A) | 895 | 951 | 975 | 1438 | 1642 | 1596 |
| Indianapolis, Indiana (A) | 640 | 721 | 705 | 1035 | 1226 | 1090 |
| Jackson, Mississippi (A) | 276 | 407 | 310 | 359 | 467 | 379 |
| Kansas City, Missouri (A) | 455 | 651 | 621 | 656 | 982 | 905 |
| Knoxville, Tennessee (A) | 412 | 430 | 498 | 586 | 715 | 710 |
| La Crosse, Wisconsin (A) | 818 | 917 | 921 | 1285 | 1604 | 1520 |
| Lander, Wyoming (A) | 1005 | 1198 | 1050 | 1670 | 2041 | 1926 |
| Lewiston, Maine (O) | 809 | 730 | 876 | 1588 | 1426 | 1542 |

(a) Data not available.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively. [Table concluded on page 136]

# When you need copper tube fittings look for the Anaconda orange and black carton

**COMPLETE RANGE OF TYPES AND SIZES**

Brass Fittings for Flared Tubes. In all standard combinations, nominal sizes from 1/8" through 3"

Wrought-Copper Solder-Joint Fittings. Nominal sizes 1/8" through 4"

Flanged Fittings. In sizes to meet all standard requirements

Accessories. Hangers, Flanging and Sizing Tools, Tube Straps

Cast-Brass Valves. Full range of standard sizes and combinations

Cast-Brass Solder-Joint Fittings. Nominal sizes from 1/8" through 12"

Wrought-Copper Solder-Joint Fittings for Refrigeration and Air Conditioning use. Actual OD sizes 3/16" through 4 1/8"

Cast-Brass Solder-Joint Drainage Fittings. In all standard combinations from 1 1/4" through 8"

Designed for your convenience, the new Anaconda carton serves as a handy container on the job, in your truck or in the stock room. Contents are clearly indicated so you can quickly spot the fittings needed.

These new cartons are being placed in the hands of Anaconda distributors as quickly as possible, but whether in the new package or not, Anaconda Fittings are the best you can buy. On your next copper job, use products that you can depend on—use Anaconda Copper Tubes and Anaconda Fittings.

**HAVE YOU OUR CATALOG,** "Anaconda Copper Tube Fittings and Valves"? If not, write for a copy today. It lists, with illustrations and roughing-in dimensions, the complete range of Anaconda Fittings in sizes from 3/16" through 12" for all copper tube applications—general plumbing, heating, air conditioning and refrigeration. Ask for Anaconda Publication C-12. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario, Canada. 5806

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**COPPER TUBE AND FITTINGS**

*Products of The American Brass Company*

**AVAILABLE THROUGH PLUMBING WHOLESALERS**

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

# Degree-Days for November, 1958 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 31st Year of Publication of Monthly Degree-Day Data

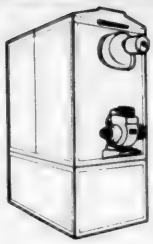
| City | November | | | Season to Nov. 30, incl., from Sept. 1 | | |
|---|---|---|---|---|---|---|
| | 1958 | 1957 | Normal | 1958 | 1957 | Normal |
| Lincoln, Nebraska (C) | 640 | 816 | 741 | 935 | 1278 | 1130 |
| Little Rock, Arkansas (A) | 314 | 378 | 405 | 439 | 542 | 525 |
| Los Angeles, California (C) | 80 | 131 | 140 | 82 | 147 | 198 |
| Louisville, Kentucky (A) | 492 | 577 | 579 | 744 | 915 | 862 |
| Lynchburg, Virginia (A) | 446 | 448 | 531 | 744 | 918 | 816 |
| Macon, Georgia (A) | 176 | 246 | 280 | 254 | 396 | 343 |
| Madison, Wisconsin (A) | 814 | 883 | 864 | 1322 | 1615 | 1420 |
| Marquette, Michigan (C) | 843 | 933 | 933 | 1528 | 1708 | 1712 |
| Memphis, Tennessee (A) | 344 | 407 | 432 | 493 | 604 | 575 |
| Meridian, Mississippi (A) | 274 | 288 | 338 | 356 | 459 | 423 |
| Milwaukee, Wisconsin (A) | 768 | 848 | 831 | 1249 | 1544 | 1373 |
| Minneapolis, Minnesota (A) | 871 | 963 | 960 | 1349 | 1647 | 1576 |
| Moline, Illinois (A) | 685 | 800 | 786 | 1067 | 1403 | 1245 |
| Montgomery, Alabama (A) | 213 | 234 | 304 | 272 | 384 | 373 |
| Nashville, Tennessee (A) | 420 | 488 | 471 | 623 | 768 | 647 |
| New Haven, Connecticut (A) | 606 | 549 | 663 | 1100 | 1013 | 1119 |
| New Orleans, Louisiana (C) | 95 | 135 | 141 | 124 | 204 | 146 |
| New York, New York (C) | 492 | 464 | 561 | 827 | 779 | 863 |
| Newark, New Jersey | 520 | 495 | 603 | 880 | 838 | 951 |
| Norfolk, Virginia (A) | 282 | 329 | 408 | 421 | 552 | 569 |
| North Platte, Nebraska (A) | 840 | 802 | 846 | 1366 | 1467 | 1391 |
| Oak Ridge, Tennessee (C) | 448 | 432 | 550 | 664 | 698 | 775 |
| Oakland, California (A) | 269 | 337 | 336 | 366 | 442 | 569 |
| Oklahoma City, Oklahoma (A) | 410 | 572 | 459 | 585 | 752 | 620 |
| Omaha, Nebraska (A) | 678 | 828 | 783 | 1002 | 1323 | 1202 |
| Parkersburg, West Virginia (C) | 541 | 574 | 600 | 901 | 1012 | 928 |
| Peoria, Illinois (A) | 652 | 758 | 759 | 998 | 1236 | 1184 |
| Philadelphia, Pennsylvania (C) | 494 | 458 | 516 | 805 | 754 | 768 |
| Phoenix, Arizona (A) | 124 | 253 | 182 | 128 | 265 | 195 |
| Pittsburgh, Pennsylvania (C) | 540 | 568 | 612 | 916 | 1026 | 966 |
| Pittsfield, Massachusetts (A) | (a) | 759 | 843 | (a) | 1512 | 1599 |
| Pocatello, Idaho (A) | 867 | 1032 | 873 | 1462 | 1736 | 1543 |
| Portland, Maine (A) | 782 | 721 | 825 | 1578 | 1373 | 1539 |
| Portland, Oregon (C) | 516 | 547 | 534 | 774 | 852 | 899 |
| Providence, Rhode Island (A) | 596 | 576 | 672 | 1119 | 1037 | 1160 |
| Pueblo, Colorado (A) | 707 | 824 | 771 | 1080 | 1229 | 1228 |
| Raleigh, North Carolina (A) | 355 | 397 | 387 | 595 | 730 | 515 |
| Rapid City, South Dakota (A) | 826 | 876 | 891 | 1365 | 1618 | 1584 |
| Reading, Pennsylvania (C) | 568 | 534 | 588 | 938 | 936 | 930 |
| Red Bluff, California (A) | 297 | 403 | 319 | 326 | 362 | 378 |
| Reno, Nevada (A) | 782 | 845 | 744 | 1314 | 1517 | 1352 |
| Richmond, Virginia (A) | 409 | 434 | 498 | 645 | 801 | 741 |
| Rochester, New York (A) | 700 | 721 | 759 | 1268 | 1356 | 1332 |
| Roswell, New Mexico (A) | 471 | 600 | 501 | 726 | 833 | 665 |
| Sacramento, California (C) | 257 | 361 | 321 | 279 | 466 | 413 |
| St. Joseph, Missouri (A) | 576 | 750 | 600 | 864 | 1169 | 882 |
| St. Louis, Missouri (C) | 437 | 607 | 570 | 635 | 905 | 810 |
| Salt Lake City, Utah (A) | 778 | 909 | 771 | 1194 | 1411 | 1240 |
| San Antonio, Texas (A) | 172 | 270 | 201 | 247 | 341 | 226 |
| San Diego, California (A) | 93 | 126 | 147 | 94 | 134 | 223 |
| Sandusky, Ohio (C) | 614 | 680 | 684 | 980 | 1184 | 1077 |
| San Francisco, California (C) | 205 | 239 | 237 | 356 | 376 | 475 |
| Sault Ste. Marie, Michigan (A) | 908 | 897 | 1005 | 1756 | 1805 | 1942 |
| Savannah, Georgia (A) | 144 | 209 | 225 | 228 | 319 | 263 |
| Scranton, Pennsylvania (A) | 711 | 685 | 693 | 1331 | 1303 | 1197 |
| Seattle, Washington (C) | 573 | 557 | 540 | 943 | 924 | 1003 |
| Sheridan, Wyoming (A) | 930 | 975 | 957 | 1631 | 1860 | 1774 |
| Shreveport, Louisiana (A) | 261 | 310 | 305 | 346 | 425 | 358 |
| Sioux City, Iowa (A) | 790 | 868 | 885 | 1179 | 1461 | 1418 |
| Spokane, Washington (A) | 868 | 877 | 879 | 1546 | 1595 | 1592 |
| Springfield, Illinois (A) | 602 | 721 | 666 | 937 | 1185 | 981 |
| Springfield, Missouri (A) | 483 | 642 | 615 | 779 | 993 | 925 |
| Syracuse, New York (A) | 683 | 685 | 714 | 1267 | 1273 | 1227 |
| Toledo, Ohio (A) | 681 | 741 | 756 | 1165 | 1357 | 1245 |
| Topeka, Kansas (C) | 553 | 683 | 630 | 846 | 1037 | 914 |
| Trenton, New Jersey (C) | 540 | 493 | 582 | 923 | 864 | 922 |
| Tulsa, Oklahoma (A) | 345 | 515 | 462 | 509 | 743 | 632 |
| Utica, New York (O) | 686 | 732 | 781 | 1309 | 1318 | 1393 |
| Valentine, Nebraska (A) | 854 | 902 | 891 | 1433 | 1599 | 1497 |
| Walla Walla, Washington (C) | 636 | 673 | 675 | 1021 | 1161 | 1076 |
| Washington, D. C. (C) | 451 | 462 | 510 | 682 | 810 | 773 |
| Wichita, Kansas (A) | 491 | 687 | 597 | 731 | 1045 | 848 |
| Williston, North Dakota (C) | 1104 | 1015 | 1101 | 1849 | 1918 | 1967 |
| Winnemucca, Nevada (A) | 790 | 957 | 822 | 1450 | 1714 | 1510 |
| Yakima, Washington (A) | 821 | 844 | 807 | 1465 | 1448 | 1403 |

For footnotes, see page 134.

New

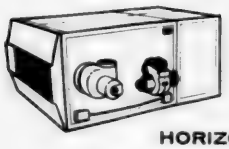
# MAXI-THERM

## Stainless Steel, Heavy Duty Furnaces

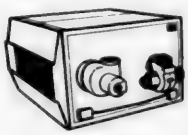


UP FLOW

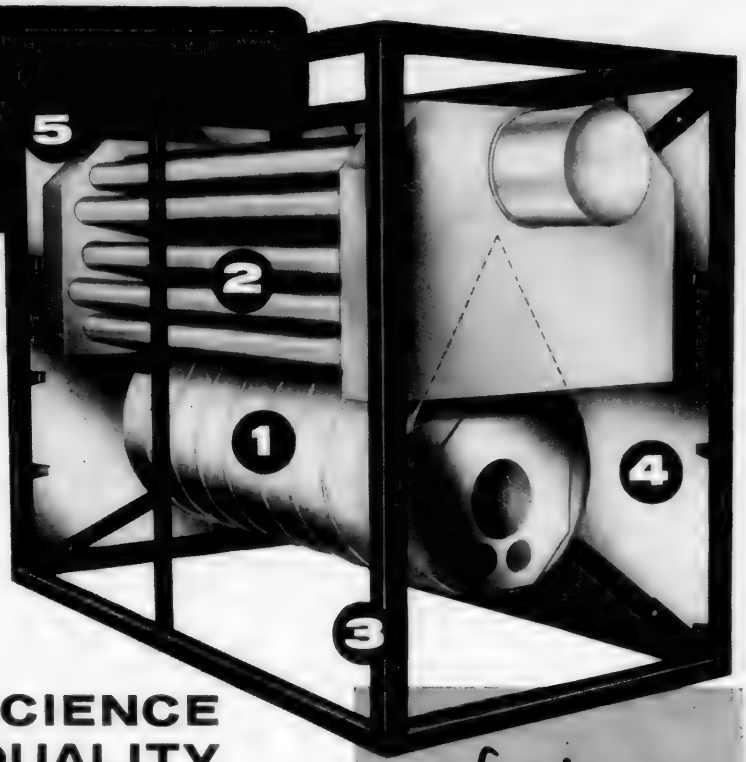
COUNTER FLOW



HORIZONTAL



DUCT




## FOR THE CONSCIENCE CALLING FOR QUALITY

Humble of birth but proud of purpose, a new high capacity furnace has come into being after years of development and field-proof. It is built for the discerning – those willing to set patterns, not follow them – those who can tell a quality product without its name plate. Yet this quality is somewhat betrayed by its price which will appeal to all.

Not a new concept in industrial and commercial warm air heating, but rather a new philosophy – a promise of superiority from engineering down to the last weld in the new, stronger, heavier gauge #442 stainless steel combustion chamber. As a small manufacturer, we cannot afford to settle for less. The success of MAXI-THERM must be linked strongly to its inherent quality.

And once you have inspected the new MAXI-THERM in any of its four models, you will agree that while our sights are set high, the finished product is "on the target."

For industrial and commercial applications from 120,000 to 2,500,000 BTU's. Larger specials can be constructed to your specifications. Available in Up Flow, Counter Flow, Duct and Horizontal Models to fit any space requirement efficiently. Oil and/or gas fired, single or dual fuel. Firing equipment U.L. or A.G.A. inspected or approved. Also a complete line of refractory lined furnaces in standard capacities to 2,000,000 BTU's.

## features

1. New, stronger, heavier gauge #442 stainless steel ribbed tear-drop construction, two-pass combustion chamber for longer life and greater efficiency.
2. Two-pass aluminized steel exchanger provides a four-pass system.
3. Quint-Angle one-piece welded 12-gauge frame construction.
4. Polished radiant shield.
5. Tube and transfer box access plate.

*Write for specification details or representation information*

CSF

**Chicago Steel Furnace Co.**

9324 S. Anthony Ave. • Chicago 17, Illinois

# NEWS OF THE MONTH

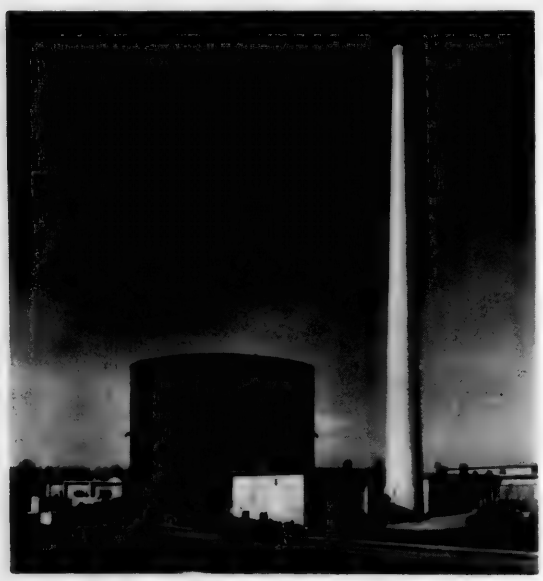
## BROOKHAVEN REACTOR

**is housed in air conditioned, gas-tight building. Designed specifically for atomic medical research.**

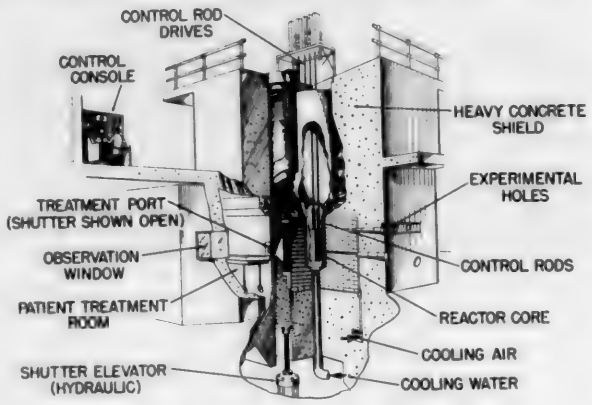
The Nation's newest atomic medical research center, including the world's first nuclear reactor designed specifically for medical use, was dedicated December 16, 1958 at Brookhaven National Laboratory, Upton, L. I., N. Y. Brookhaven is operated by Associated Universities, Inc., for the U.S. Atomic Energy Commission. In addition to the reactor, the new Brookhaven Medical Research Center includes a 48-bed hospital for research patients and laboratories for studies on medical applications of atomic energy.

• **21-TON SHUTTERS**—Construction of the $6.5 million medical research center was begun in mid 1956 as part of the Commission's program for research on medical applications of atomic energy. The medical research reactor, which is scheduled for operation early in 1959, includes unique design features for use in research treatment of ailing humans and animal experimentation. Two ports through the heavy concrete shielding walls on opposite sides of the reactor permit streams of neutrons from the core to pass into treatment rooms, one for patients and one for experimental animals. The beams can be shut off by means of thick 21-ton shutters in three seconds. In addition, the kinds of radiations in the beams can be varied by inserting various combinations of absorber and "convertor" plates in the beam.

A third face of the reactor is equipped for the general irradiation of large objects and the fourth has tubes, "rabbit holes", leading into the core to permit irradiation of small samples of various materials for diagnostic purposes and the making of short-lived radioisotopes. The availability of these isotopes at the hospital site, where they can be used quickly before they decay, will make possible a broad range of medical investigation into fundamental body processes.



**Medical Research Reactor building. Cooling air for the reactor's graphite reflector is forced out of the 150-ft stack. The steel reactor building, which is 60 ft in diameter and 54 ft high, is connected to the main medical research complex, where the hospital and laboratories are located.**




**Details of medical research reactor.**

These rooms and facilities are enclosed within outer concrete shielding walls and the whole encased in a steel cylindrical tank, making a gas-tight building 60 ft in diameter and 54 ft high. The reactor building is entered by connecting corridor from the main hospital through an air lock. Doors of the air lock are equipped with inflatable rubber gaskets. The reactor building is maintained under negative air pressure, and a water-leg safety valve through the outer shell safeguards against sudden changes of air pressure, either inward or outward. Both the reactor building and main hospital are air conditioned.

• **EXHAUST AIR COOLS**—The core of the reactor consists of uranium-aluminum fuel plates surrounded by pure aluminum. The fuel elements are enclosed in a 2-ft diameter aluminum tank. They are cooled by highly purified natural water flowing up through the core tank where it is heated to about 180 deg F. Cooling water proceeds upward through a degassifying tank where any nitrogen formed by nuclear reaction is released. From there water flows in a closed circuit to heat exchangers where well water removes about a megawatt of energy and is then reinjected into diffusion wells.

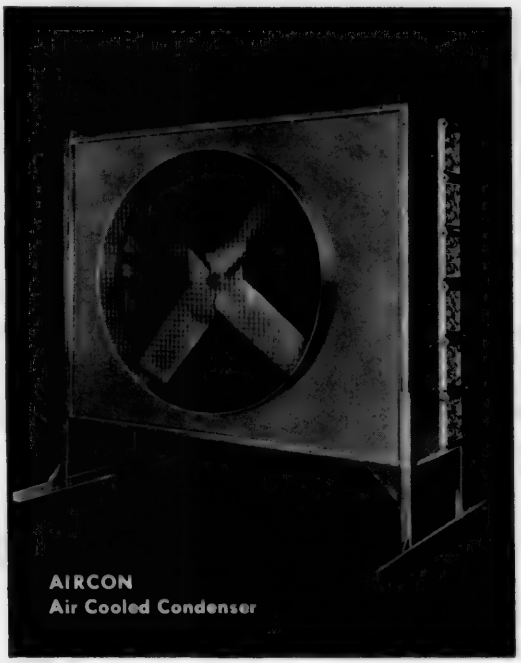
Surrounding the core is an air-cooled graphite reflector which helps concentrate neutron beams through the treatment ports. Cooling air consists of all exhaust air from the once-through air conditioning system. After cooling the graphite, air is forced through absolute filters and thence up through a 150-ft stack.

The laboratories and the research hospital are housed in a one-floor building of approximately 110,000 ft, plus a basement area of 22,000 sq ft for mechanical services.

Special facilities in the laboratory sector include cold rooms, constant temperature rooms, humidity-controlled

*(News of the Month continued on page 154)*

# MORE *Models*
# MORE *Capacity*
# MORE *Performance*




## McQuay AIR COOLED CONDENSERS

**UP TO 50 TONS IN A SINGLE UNIT—UNLIMITED CAPACITY IN MULTIPLE INSTALLATION**

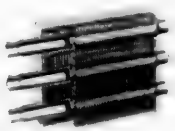
**McQuay Aircon** remote waterless condenser. Ten models, 3 to 50 ton capacity. Belt or direct drive models. Lifetime ball bearing and slow speed propeller type fans. McQuay Seasontrol modulates condenser capacity in accordance with weather for peak performance all year 'round.

WHEN you use McQuay Aircon air cooled condensers you have 10 models to choose from and you get from 3 ton to 50 ton capacity in a single unit! With multiple installations, capacities are unlimited.

You not only get more models and more capacity but you get more performance, because McQuay Aircons have the exclusive McQuay Ripple Fin coils—the finest and the standard of the industry.

With the present emphasis on remote waterless condensers, look to McQuay. Compare construction, compare features, compare the all around quality. Belt or direct drive models are offered. See your McQuay representative or write McQuay, Inc., 1619 Broadway Street N.E., Minneapolis 13, Minnesota.

McQuay Means Quality

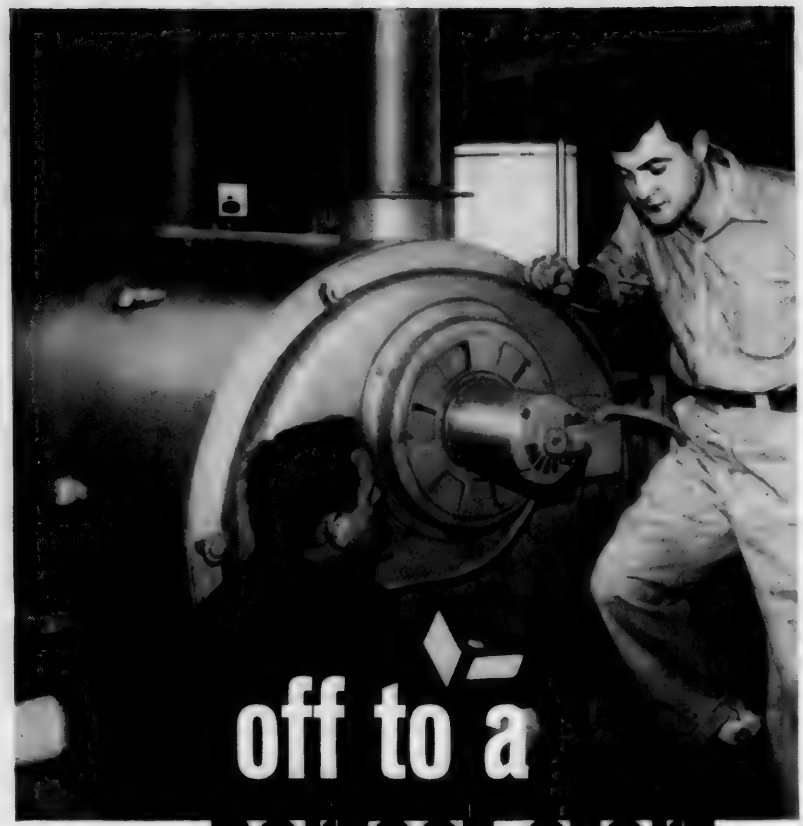


McQuay units feature the exclusive Ripple Fin Coils which create maximum air turbulence and have wide, full fin collars that act as automatic spacers to form a tube around the coil tube for greatest heat transfer and protection.

McQuay INC.

MAKE THE SEASONS COME TO YOU

AIR CONDITIONING • HEATING • REFRIGERATION




**Cleaver-Brooks starting service sends Progress packaged boilers off to a right start . . . assures tip-top boiler performance . . . greater customer satisfaction.**

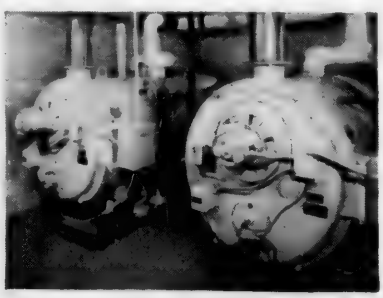
This unique starting service is typical of many extra values you enjoy when you install America's finest commercial heating boiler . . . more evidence of Cleaver-Brooks undivided responsibility for boiler performance.

1. Every Progress boiler is started by a trained Cleaver-Brooks serviceman. He adjusts it carefully for fuels and loads on job site. This means fewer hours on the job for you . . . less cost . . . fewer call backs. It means superior performance, more satisfied customers.
2. Cleaver-Brooks serviceman trains the boiler attendant . . . instructs him in the care and operation of the boiler. This relieves you of the time and cost of this important follow-up responsibility.

Other important profit-making advantages in the Progress packaged heating boiler: packaged design, fully factory-tested, ready to install on the job site. Clean, quiet operation. High efficiency: 80% guaranteed. Hinged doors simplify maintenance.

Built by America's largest builder of packaged boilers.

Cleaver-Brooks Progress Boilers—seven sizes to 2,010,000 Btu.—for all types of commercial heating with oil, gas or combination oil/gas. Write: Dept. A, 315 E. Keefe Ave., Milwaukee 12, Wis.



Cleaver Brooks®

**Progress**

**Packaged Heating Boiler**

See you at the International Heating and Air Conditioning Exposition, Convention Hall, Philadelphia, Booths C121 & C125.

# NEW CATALOGS

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**ELECTRIC WALL INSERT HEATERS** — A 2-page bulletin on an electric, fan-driven, wall insert heater for home, motel and office-type installations is available from Ilg Electric Ventilating Co., Chicago, Ill. Bulletin 1101 gives complete specifications and construction data on three units having capacities of 6824, 10,236 and 13,648 Btu per hr output.

Circle **Item 54** on Inquiry Card

**COOLING TOWERS**—Flexi-Tower, a new cooling tower with adjustable capacity, is described in 8-page Bulletin 206, published by Baltimore Aircoil Co., Inc., Baltimore, Md. In addition to photos of the towers and component parts, dimensional drawings, and selection charts, the brochure explains how capacity of the tower can be adjusted over a wide range by varying spray pressure.

Circle **Item 55** on Inquiry Card

**PACKAGED BOILERS**—Packaged boilers are the subject of a 10-page bulletin offered by Western Boiler Co., Los Angeles, Calif. Packaged rotary forced draft and packaged pressure forced draft units, for heating, power, and process steam needs, are described. Included are design and performance features, and complete specifications.

Circle **Item 56** on Inquiry Card

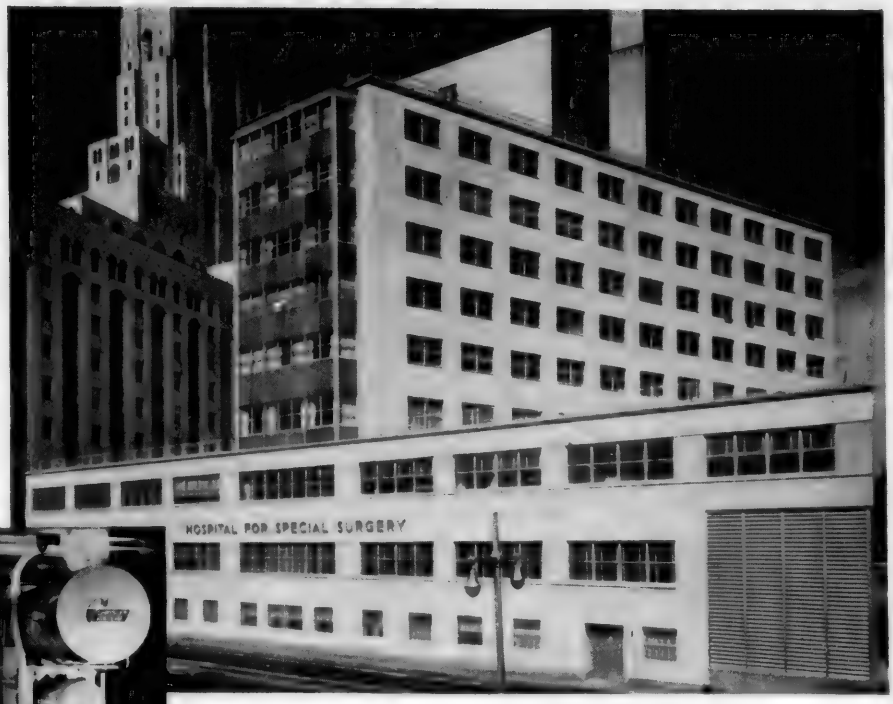
**SPECIAL PURPOSE FIXTURES**—In its 64-page "Sketch Book of Special Fixtures," The Chicago Faucet Co., Chicago, Ill., presents descriptive and dimensional data on an array of special purpose water faucets ranging in service from hospitals to prisons. Designed to supplement the company's general catalog, the Sketch Book is intended as a work book, with detailed dimensions and roughing-in data.

Circle **Item 57** on Inquiry Card

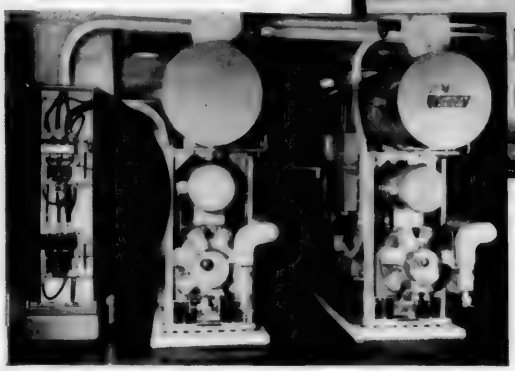
**HIGH VELOCITY FILTER**—Farr Company, Los Angeles, Calif., announces a 4-page bulletin describing its high velocity panel impingement filter. The bulletin (B-100-2B) contains detailed information on the standard Type 44 filters, including how to specify filters and holding frames.

Circle **Item 58** on Inquiry Card

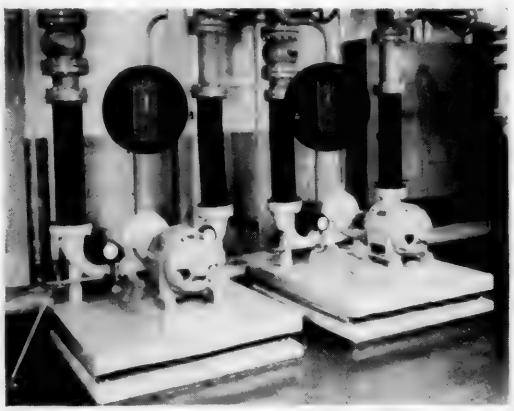
*(Continued on page 142)*




The Hospital for Special Surgery, New York City



One of the two A-B Bulletin 736 Size 5 part winding reduced voltage starters used with the 125 hp, 220 v motors for the packaged chillers.



This shows two A-B Bulletin 712 Size 2 combination starters for the 15 hp, 220 v condenser pumps.

Heating, Ventilating, and Air Conditioning Contractor: Kennedy-Scheidel and Young, Inc.; Engineers: Meyer, Strong and Jones.

# Allen-Bradley Control was a "Natural" — because dependability was so important in this air-conditioning system

Each year more and more air conditioning consulting engineers select Allen-Bradley quality motor control because they *know* it will provide the dependable performance that they—and their customers—must have.

Allen-Bradley motor controls are reliable because they have the simplest operating mechanism yet devised . . . there is only ONE moving part. This solenoid construction—which only Allen-Bradley can furnish in *all* starters up through Size 8—is your assurance of years of trouble free performance. There are no bearings to corrode and stick . . . no flexible jumpers to wear and break. And the double break, silver alloy contacts are always in perfect operating condition . . . and *remain* so until completely worn away. In addition, all A-B starters have permanently accurate thermal overload relays that prevent motor burnouts.

You will obtain the motor control of *proven* reliability if you insist on Allen-Bradley. It's the motor control you can install . . . and forget!

Allen-Bradley Co.
1330 S. Second St.
Milwaukee 4, Wis.
In Canada:
Allen-Bradley Canada Ltd.
Galt, Ontario

A-B QUALITY

ALLEN-BRADLEY
QUALITY

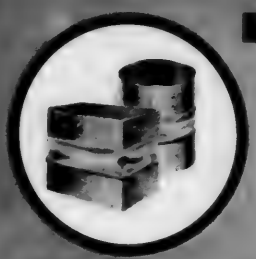
ALL SHIPPED IN DISPENSER-TYPE CARTONS

CAINS

COILS OF PROFIT

*Quick, Economical, Easy, and Practical Methods for - - -*

FABRICATING FLEXIBLE DUCT CONNECTIONS
VANES FOR ELBOWS • AIR SCOOPS AND LOUVERS



PRE-FAB-RIC

A PREFABRICATED FLEXIBLE DUCT CONNECTION

Using a fabric (of your choice) in the center with a galvanized metal strip on each side. *Double-Safe Locked* together in a single continuous piece, coiled in a dispenser-type carton ready for use

A TYPE, SIZE, AND PRICE FOR ALL JOBS

THREE GRADES
Commercial - Economy
Residential

THREE FABRICS
Canvas - Asbestos
Neoprene

FAB-RIC

TOP QUALITY FABRICS (Without Metal)
Same Weight and Width (3") Used in PRE-FAB-RIC. Put Up in 100' Rolls

INSTANT-VANE RAIL

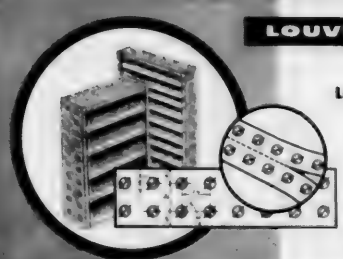
ELIMINATES

**Layout, Tab Cutting, Hole Punching, Spot Welding, Riveting, Etc., Results in a Savings Up to 70% over old methods.**

Best method ever devised for installing turning vanes (single or double) in sq. elbows.

100 FT. COILS

ENGINEER APPROVED



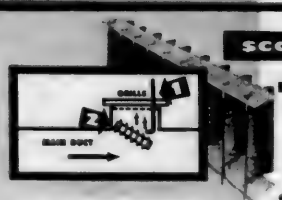
LOUVERAIL

ELIMINATES

**Layout, Tab Cutting, Hole Punching, Riveting, Spot Welding, Etc.**

AN ECONOMICAL AND PRACTICAL METHOD FOR FABRICATING LOUVERS — REMOVABLE, HINGED, OR STATIONARY. LOUVERAIL is 24 ga. galvanized 4½" wide in (2—50' lengths) 1 right and 1 left coiled together.

Split (1½) Rail for Louver Thicknesses From 1¼" to 1¾"
Use Full Size Rail for Louver Thicknesses From 3¼" to 4"




SCOOP-RAIL

ELIMINATES—
- Radius oil, transition, and splitter damper at branch duct take-offs.
- Volume damper on grille.
- Job delay in ordering.

USED AT BRANCH DUCT

1. Not necessary to remove grille to adjust volume. Use bent rod or wire thru grille to adjust unit in and out of main duct.
2. S. M. screws at top and bottom.

**SCOOP-RAIL** for fabricating air scoops for branch ducts and grille collars. Insuring uniform air distribution. Complete control of air volume in branch duct or at grille face. Simplifies balancing of the system.

1. ⅜" standard quadrant where accessible
2. Speed nut tabs for ⅛" square rod are riveted, spotwelded or s. m. screwed to ends of SCOOP-RAIL.
3. Where desired clg. control may be used.

SOLD ONLY THROUGH JOBBERS AND DISTRIBUTORS
Some Ventilation Open for Manufacturers Agents Calling on Jobbers and Distributors

CAIN MANUFACTURING CO.

1111 North 8th Avenue Phone FA 2-0354 Birmingham, Alabama

# NEW CATALOGS

*(Continued from page 140)*

**Use the prepaid postcard on last page for securing your copies of catalogs described in this department.**

**WATER TREATMENT**—A leaflet outlining the services performed by Water Service Laboratories Inc., New York, N. Y., is offered by the firm of research and consulting engineers specializing in the field of water treatment. Leaflet describes the company's principal areas of operation which are: protecting air conditioning systems against corrosion damage; extending the life of water piping systems in buildings; maintaining the efficiency of heating boilers and power boilers. Also discusses the company's consulting work and water analyses.

Circle **Item 59** on Inquiry Card

**SOLAR SCREENS**— Responding to a growing interest in controlling solar heat and glare, Reflectal Corp., a subsidiary of Borg-Warner Corp., Chicago, Ill., offers a comprehensive brochure on Koolshade sunscreen. Brief case histories demonstrate substantial savings in air conditioning tonnage, as well as improved lighting balance obtained with the screens.

Circle **Item 60** on Inquiry Card

**CAST IRON BOILERS** — The Peerless Heater Co., Boyertown, Pa., offers an 8-page catalog on its Series 150 high capacity, gas-fired cast iron boilers. Front and end view drawings, ratings, dimensions, and specifications of 33 sizes are provided.

Circle **Item 61** on Inquiry Card

**BRONZE VALVES** — Ohio Brass Co., Mansfield, Ohio, offers condensed catalog pages covering its complete line of bronze, globe, angle, check, gate, radiator and specialty valves. Material is so listed in the 12 pages that the reader can quickly find pressure ratings, recommended uses, features, and roughing-in dimension for each valve in a wide range of sizes.

Circle **Item 62** on Inquiry Card

**DUST COLLECTORS**—New information sheets describing two versatile cabinet cloth filter dust collectors have been published by Torit Manufacturing Co., St. Paul, Minn. Sheets include multiple rating tables, complete specifications and a dimensional drawing.

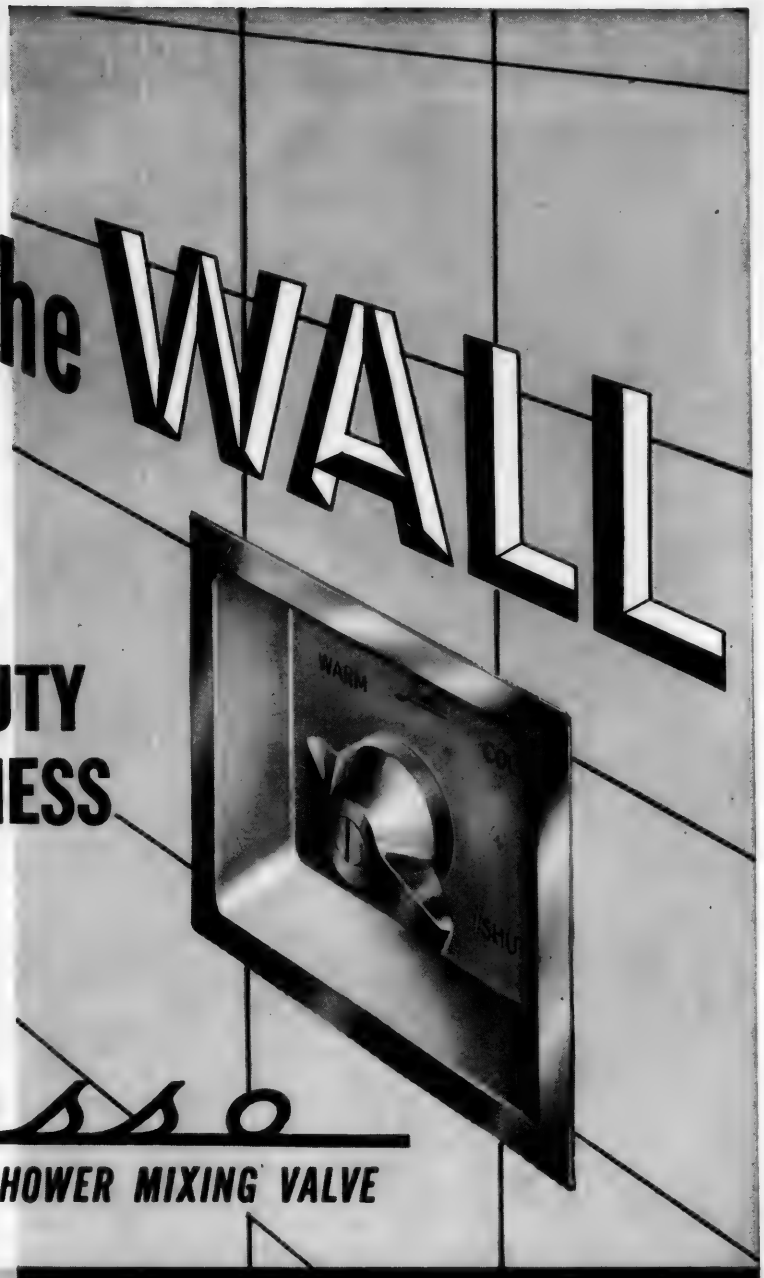
Circle **Item 63** on Inquiry Card

*(Continued on page 144)*

# RECESSED into the WALL

for...

## EXTRA SAFETY
## LUXURIOUS BEAUTY
## ADDED CLEANLINESS




THE *Recesso*

THERMOSTATIC SHOWER MIXING VALVE

*Another Quality Product of*

THE *Lawler Line*

OF THERMOSTATIC CONTROL VALVES

**Lawler Automatic Controls, Inc.**

MT. VERNON, N. Y.

Lawler brings you an exclusive advantage ... one found nowhere else! Dependable thermostatic control! It's the RECESSO ... the only shower valve that's built into the wall for complete safety. NO PROTRUDING EDGES to cause bodily harm. DE LUXE DESIGN that's crisp and clean-cut. EASY CLEANING because there's nothing to collect soap scum, dirt or grime.

**COMPLETE SAFETY FROM SCALDING**

New all-valved valve design makes scalding virtually impossible. If cold water fails RECESSO automatically shuts off hot water.

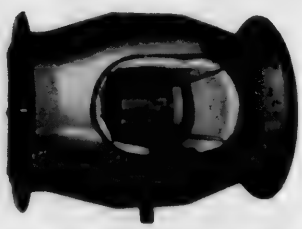
See us at the show—BOOTH 931

# Here are DOERR motors at work!

AIR-COOLED CONDENSERS

*(Left)* **KRAMER TRENTON CO.** Unicon, designed for large capacity installations.

*(Right)* Type AC5A unit offered by the **TRANE CO.** For use with packaged air conditioners.



Induced draft bifurcator made by **DE BOTHEZAT FANS** Division of American Machine and Metals, Inc. Motor is special variable-speed type with Class B insulation for high temperature operation.

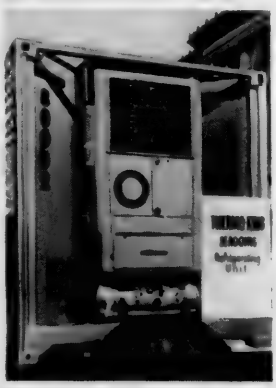
**YOUNG RADIATOR CO.** cabinet-type heater with cover removed to show double-shaft blower motor.

AIR CONDITIONING PUMPS

**AURORA**

Circulating pumps designed for cooling tower service in sizes from ¼ to 7½ hp.

**INGERSOLL-RAND**



Large trailer truck refrigeration unit by **THERMO KING CORP.** for intercoastal shipping. Stand-by power furnished by 7½ hp. DOERR motor with protective features for use in salt water atmosphere.

**THESE** leading manufacturers and many others are getting *more* by using Doerr motors.

Our fifth consecutive appearance in the Heating and Air Conditioning Exposition indicates our interest in this important field.

The variety of designs required by the applications shown is proof of our willingness and ability to meet special design problems.

Contact DOERR on your next motorization problem.

**DOERR now offers:**

★ **Standard and special A-C motors from 1/30 to 15 hp.**

★ **Right-angle gearmotors to 3 hp.**

*Write, wire or phone for complete data.*

**YOU GET *MORE* WITH DOERR!**

**DOERR**
*Electric Corporation*
300 North Fourth Avenue
CEDARBURG, WISCONSIN

# NEW CATALOGS

*(Continued from page 142)*

**Use the prepaid postcard on last page for securing your copies of catalogs described in this department.**

**ROOM FAN-COIL UNITS**—A 12-page brochure (Bulletin 9327), describing the Diaflo line of air conditioners, is available from American Standard, American Blower Division, Detroit, Mich. Features of units are outlined; the various enclosures are described and illustrated. Cooling ratings are listed in tabular form for 200, 300, 400 and 600 cfm sizes. A series of installation-type drawings provides dimensional data; typical specifications are included.

Circle **Item 64** on Inquiry Card

**INDUSTRIAL BURNERS**—Folder No. 5807, published by Iron Fireman Manufacturing Co., Cleveland, Ohio, describes the company's new series of AirRing packaged industrial burners, with built-in fuel and air systems. Detailed cutaway views, diagrams and photos illustrate how the integral air register improves combustion and reduces installation costs.

Circle **Item 65** on Inquiry Card

**ONE-PIECE PIPE INSULATION**—Gustin-Bacon Manufacturing Co., Kansas City, Mo., offers a 10-page brochure describing its Snap-On pipe insulation. Much of the booklet is devoted to material and application specification for various piping arrangements and services. Other topics include sample specifications, recommended jackets, recommended thicknesses, and packaging data.

Circle **Item 66** on Inquiry Card

**AUTOMATIC CONTROL SYSTEMS** — Barber-Colman Co., Rockford, Ill., offers a brochure which is set forth as a guide to assist engineers in designing and planning an automatic control system for most types of heating, ventilating and air conditioning installations. The brochure, F-8944, analyzes the three important phases of automatic control system planning. Part one discusses the application, advantages and features of electronic control centers; part two presents the three basic types of control and their advantages and component structure; part three deals with selecting the power control system.

Circle **Item 67** on Inquiry Card

*(Continued on page 146)*

# AGITAIR®

## *Custom Made*

**SQUARE and RECTANGULAR**

## AIR DIFFUSERS

Custom made in unlimited air patterns, AGITAIR square and rectangular air diffusers suit all job conditions... blend perfectly with any interior design.

These AGITAIR diffusers need not be centrally located. They assure draftless, noiseless, equalized air distribution from any location in the ceiling or side wall.

***Write for Catalog R107 for complete data on these Agitair Diffusers***

THERMOTANK — AGITAIR®

high velocity units • punkah louvers
air diffusers • filters • exhausters

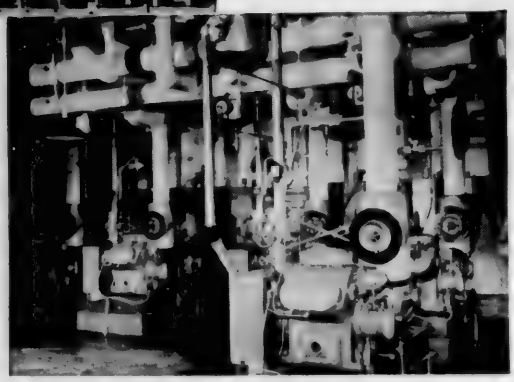
*Sold exclusively by representatives for:*

**AIR DEVICES INC.**

**185 MADISON AVENUE, NEW YORK 16, N. Y.**

Famous Nell House of Columbus, Ohio, chooses Vilter Air Conditioning to provide their guests with controlled comfort year 'round.

Shown are the five Vilter six-cylinder ammonia compressors which provide most of the refrigeration. Other Vilter equipment includes: evaporative condensers, Pakicer, for their ice requirements in kitchen and bottle beverage room service, shell and tube brine coolers to supply cold brine for the kitchen refrigerators and cold storage rooms, and air conditioning units. Complete automatic control is provided.



# Famous Convention Hotel Enjoys VILTER Air Conditioning

● The Neil House, one of the outstanding convention hotels of the nation located in Columbus, Ohio, believes wholeheartedly in the drawing powers of air conditioning. A satisfied Vilter customer since 1939, it has continued, through the years, to extend its air conditioning facilities . . . Vilter units being specified in each case.

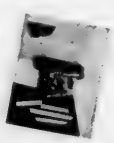
Prominent among Vilter equipment are the feature-packed VMC ammonia compressors which are installed in the power plant across the street—their compact design insures more capacity in less space . . . assure lower maintenance cost because of interchangeability of components . . . provide efficient, economical performance, guaranteed for a long life. Your refrigeration dollar buys more in a Vilter VMC.

Installed on the roof of the power plant are Vilter Evaporative Condensers. They save you 90 to 95% in water costs . . . provide low pumping costs, eliminate waste water disposal problems, and may be installed indoors or out. Vilter Evaporative Condensers mean lower cooling costs.

See your nearest Vilter distributor for engineering assistance in designing an air conditioning and refrigeration system to your needs.

**Write to The Vilter Manufacturing Company, Dept. G-704, 2217 S. First Street, Milwaukee 7, Wisconsin, for helpful literature.**

Bulletin 732 Vilter Evaporative Condensers



Bulletin 631 Vilter Uni-Chillers

Bulletin 429 Vilter VMC Freon Compressors

Vilter®

REFRIGERATION and AIR CONDITIONING

**THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin**

Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines


# NEW CATALOGS

*(Continued from page 144)*

**Use the prepaid postcard on last page for securing your copies of catalogs described in this department.**

**HEAT TRANSFER EQUIPMENT**—Bulletin No. 123-6, in 8 pages, contains product information and selection data for storage water heaters and heat exchangers manufactured by Patterson-Kelley Co., Inc., East Stroudsburg, Pa. Equipment includes copper-lined, copper silicon, cement-lined, and steel storage heaters, and 2-pass and 4-pass converters. Selection data consists of hot water fixture capacities; temperature conversion factors; heating and storage capacities; standard dimensions, weights, and connections; line diagrams and typical applications of data.

Circle **Item 68** on Inquiry Card

**DRAFT AND COMBUSTION**—The what, where, how, and why of draft as it affects the efficiency of the combustion process, together with full details about various types of the company's draft gages, constitutes a 19-page bulletin published by The Hays Corporation, Michigan City, Ind.

Circle **Item 69** on Inquiry Card

**TWO-WAY RADIO**—Virtually any United States citizen engaged in a legitimate commercial pursuit can now apply for a two-way radio license under new regulations of the Federal Communications Commission. Two radio services of specific interest to small businesses and large industrial firms have been created by the FCC to be known as Business Radio Service and Manufacturer's Radio Service. Bulletin ECR 576, from Communication Products Dept., General Electric Co., Syracuse, N. Y., explains the FCC categories, and describes the types of equipment available.

Circle **Item 70** on Inquiry Card

**WELDING FITTINGS, FLANGES** — Complete dimensional data on the company's line of stainless steel welding fittings and flanges are contained in a revised catalog, TT600, available from Tube Turns, Louisville, Ky., division of Chemetron Corp. Updated technical data for allowable S-values, allowable working pressure of fittings, pressure-temperature rating of flanges, and corrosion resistance are contained in the 54-page booklet. Corrections have been made to reflect recent code changes, and to conform with new code interpretations for Types 304L and 316L stainless steel.

Circle **Item 71** on Inquiry Card

*(Continued on page 148)*

Bishop Clarkson Memorial Hospital — Omaha, Nebraska

**Leo A. Daly Company**
*architect-engineer*

**Peter Kiewit Sons Co.**
*general contractor*

**Natkin & Company**
*plumbing contractor*

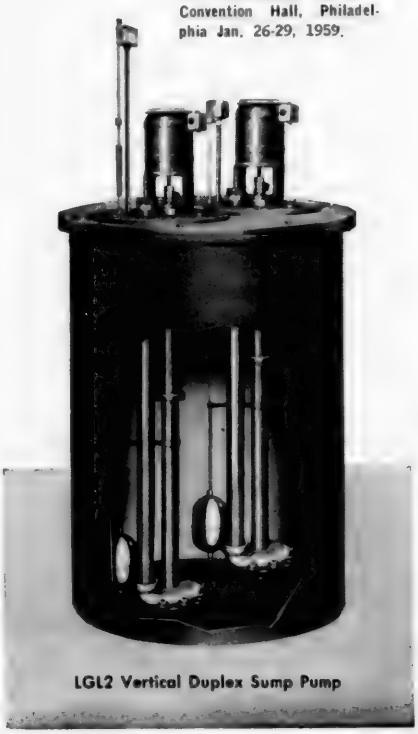
• See Our Exhibit at the 14th International Heating and Air Conditioning Exposition Convention Hall, Philadelphia Jan. 26-29, 1959.

# "Chicago" Vertical Duplex Sump Pumps Protect Bishop Clarkson Memorial Hospital

***Quiet Operating . . . Low Cost . . . Dependable***

"Chicago" Type LGL2 Vertical Duplex Sump Pumps are ready to provide instantaneous and lasting protection against flooding of vital mechanical equipment at the Bishop Clarkson Memorial Hospital . . . winner of The Modern Hospital Honor Award in 1955.

These pumps include a mechanical alternator to automatically transfer operation from one pump to the other, equalizing wear and allowing both pumps to operate when inflow to the basin exceeds the capacity of one pump.



LGL2 Vertical Duplex Sump Pump

## IMPORTANT MECHANICAL FEATURES:

- Oilless guide bearings requiring no lubrication.
- Cast iron strainers
- Efficient bronze impellers
- Grease lubricated ball thrust bearings

49 years of engineering and manufacturing experience are incorporated in all Chicago Sump Pumps to insure highest quality . . . trouble-free service.

Architects and Engineers are invited to write direct or contact Chicago Pump Company Distributors located in most principal cities for bulletins and complete engineering data.

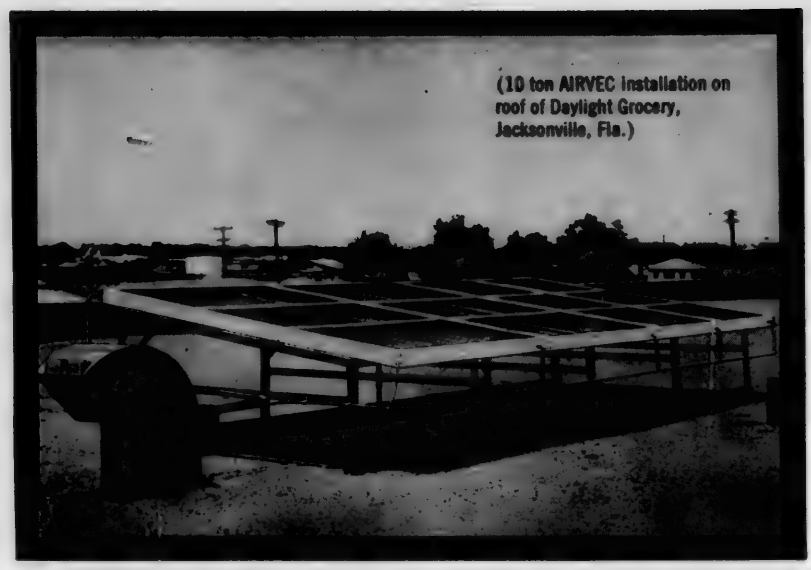
*Putting Ideas to Work*

FOOD MACHINERY AND CHEMICAL CORPORATION

**Chicago Pump Company**

6222 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Copyright 1958—Chicago Pump Company



(10 ton AIRVEC installation on roof of Daylight Grocery, Jacksonville, Fla.)

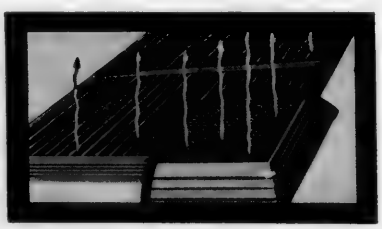
# EDWARDS AIRVEC

**...the air-cooled refrigerant condenser that eliminates fans, cooling towers, noise and maintenance.**

For condensing refrigerants Edwards AIRVEC offers a simple, economical method that makes possible, for the first time, the elimination of fans, motors, and cooling towers! Because of its unique operating principle, AIRVEC requires no electrical power—the refrigeration or air conditioning system using AIRVEC requires 20% less power. With no moving parts there is no need for belts, pumps, fans or costly maintenance—and it's absolutely silent. And water is not used in the AIRVEC so there is no water treatment problem or periodic cleaning of condensers and towers.

The size of the condenser is virtually unlimited: you just assemble single AIRVEC elements in a single plane until the required area is covered. Initial installation costs are lower, too. And AIRVEC is so light that little or no special rigging is required.

Its low, unobtrusive silhouette blends easily with any architecture, leaving more useable space within the building proper. Roof loads are negligible so no extra beams are needed. Edwards AIRVEC Condensers are available in nominal sizes of 1.25, 2.50 and 3.75 tons and larger assembles up to hundreds of tons.



The refrigerant gas is cooled and condensed by the movement of convection air moving upward through the AIRVEC condenser.

Write today for comprehensive technical data.

**EDWARDS ENGINEERING CORP.**

**1608 Alexander Avenue • Pompton Plains, New Jersey**

**Telephone TEmple 5-2808 • TEmple 5-3352**


## NEW CATALOGS

*(Continued from page 146)*

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**BOILER SELECTION**—A 20-page guide, entitled How to Select a Boiler, is offered by Cleaver-Brooks Co., Milwaukee, Wis. It covers such topics as first cost vs. operating costs; selecting the right fuel; how to save on construction costs; how to solve the low headroom problem; the packaged boiler vs. the built-up boiler; boiler design standards; burner efficiency and other subjects.

Circle **Item 72** on Inquiry Card

**ALUMINUM GRILLES**—A comprehensive selection guide to its newly-developed line of Airline grilles has been prepared by Waterloo Register Co., Inc., Waterloo, Iowa. Because the line is adaptable to many air-distribution situations, the guide contains unusually detailed engineering data designed to simplify selection of the right grille for the right job.

Circle **Item 73** on Inquiry Card

**HEATING AND VENTILATING UNITS**—American Air Filter Co., Louisville, Ky., announces a product bulletin describing its line of Herman Nelson heating and ventilating units. The units are available in 12 sizes with capacities ranging from 600 to 73,000 cfm. Bulletin No. 910 gives complete information on coil selection for both steam and hot water.

Circle **Item 74** on Inquiry Card

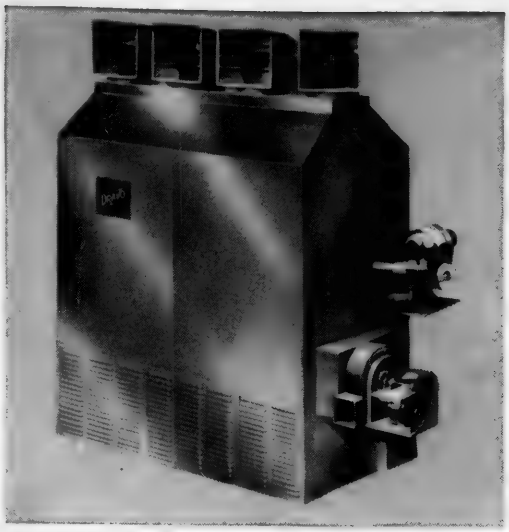
**FAN PERFORMANCE CHARTS**—Recold Corporation, Los Angeles, Calif., offers a complete set of fan performance charts, Catalog 50C8a, for the company's vertical and horizontal air conditioning units and multizone units ranging from 600 through 34,000 cfm.

Circle **Item 75** on Inquiry Card

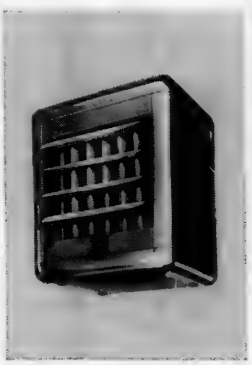
**STAINLESS STEEL PRODUCTS** — The Committee of Stainless Steel Producers, American Iron and Steel Institute, New York, N. Y., offers a new reference manual, entitled Buyers' Guide for Stainless Steel Products and Services. This 159-page book lists approximately 3000 firms which make products of stainless steel or offer services pertaining to stainless steel.

Circle **Item 76** on Inquiry Card

*(Continued on page 150)*



Dravo *Industrial* heater



Dravo *Paraflo* heater and *Suspended Unit* heater

Dravo *Commercial* heater

# ONLY DRAVO HAS ALL 4

1. **FULL LINE**—A size and type for every heating need
2. **DESIGN AND APPLICATION KNOW-HOW**
3. **NATION-WIDE SERVICE**
4. **RESEARCH**

Dravo's full line of heaters is backed by a highly trained and extensive service organization, with a reputation for dependability and thoroughness.

This is only one of the "extras" that benefit Dravo customers. The performance built into every Dravo heater is applied so that each installation functions with maximum efficiency. This is only possible because *every* Dravo technical representative *is a qualified heating engineer.*

Complete research and laboratory facilities conduct continuous studies of heater design problems. With the experience gained from over 10,000 installations, these studies result in basic improvements in all phases of both heater engineering and its application to unusual heating problems.

Make sure you get "ALL 4" when you are buying space heating. Only Dravo has the manpower, the technical background, and the facilities to assure your getting the most for your money. Write Dravo Corporation, Pittsburgh 22, Pennsylvania.

**DRAVO**
CORPORATION

**DON'T MISS THE DRAVO EXHIBIT—BOOTH 121**

for FUME

CONTROL

install

FLEXAUST®
HOSE

Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of fume and dust control, and ventilation uses.
Extremely flexible, durable, and lightweight.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Sizes 1¼" thru 36" i.d.

Write for details today
Distributors
in all principal cities

THE FLEXAUST COMPANY
Dept. HV-1
PARK AVE., NEW YORK 17, N. Y.

## NEW CATALOGS

*(Continued from page 148)*

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**REGISTERS FOR HEATING, COOLING**—A 76-page brochure designed to assist the engineer in specifying the proper register for any residential or commercial heating and cooling installation is offered by Char-Gale Manufacturing Co., Anoka, Minn. Section 1 covers residential equipment; Section 2 describes the Alumin-Aire line for commercial heating and air conditioning; Section 3 provides comprehensive engineering data on the Alumin-Aire line; and Section 4 contains purchasing information.

Circle **Item 77** on Inquiry Card

**DUCT INSULATION**—A 4-page folder, WDN-2, on glass fiber duct liners, coated with black vinyl on one side to resist air erosion, and duct wraps, with or without factory-applied vapor barrier facings, is offered by L. O. F. Glass Fibers Co., Toledo, Ohio. Folder presents advantages, thermal efficiency, acoustical performance, and gives specifications for both liners and wraps.

Circle **Item 78** on Inquiry Card

**SECTIONAL STEEL BOILERS**—Construction details, ratings, and dimensions of Series 700 sectional steel boilers for commercial and industrial use are contained in a booklet published by the manufacturer, Central States Boiler Co., Chicago, Ill.

Circle **Item 79** on Inquiry Card

**CHILLED-WATER COOLING COILS** — Chilled-water cooling coils, available in a wide range of sizes for central station and zone air conditioning systems, are described in Bulletin CWC-200 issued by Halstead & Mitchell, Pittsburgh, Pa. Bulletin contains charts with complete rating data for selection of the proper standard coils for most applications.

Circle **Item 80** on Inquiry Card

**PLUMBING PRODUCTS**—The complete line of domestic and industrial plumbing products manufactured by The Royal Brass Mfg. Co., Cleveland, Ohio, is illustrated and described in a 44-page catalog. Each item is concisely described for easy specification.

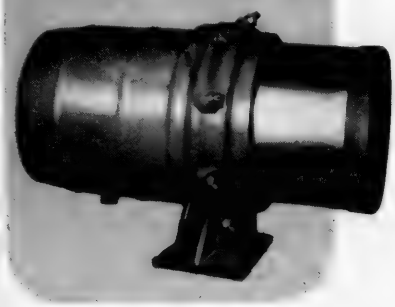
Circle **Item 81** on Inquiry Card

*(Continued on page 152)*

important points about joints

- Yarway Gun-Pakt Joints are serviced *in the line under full steam pressure.*
- Costly shutdowns eliminated.
- Maintenance records show 1 manhour per year per joint.
- Fewer expansion joints needed per length of pipeline with Gun-Pakt.

YARWAY GUN-PAKT EXPANSION JOINTS



For new Yarway Expansion Joint Catalog EJ-1916 write YARNALL-WARING CO., 104 Mermaid Avenue, Phila. 18, Pa.

go YARWAY with confidence

# Smart Modern Versatile

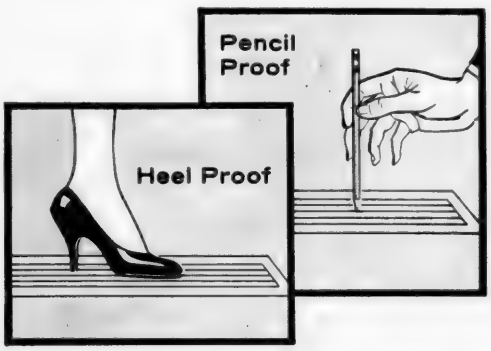
## New WATERLOO Airline Grilles

**FLOORS** **SILLS** **WALLS**

New, streamlined Waterloo Airline Grilles fit perfectly into modern architectural and engineering concepts. These extruded aluminum grilles, available up to 12 feet in length in one piece construction, are excellent for every type of floor, sill and wall application.

Designed to match a wide range of architectural finishes, Waterloo Airline Grilles feature a unique bar-support method that makes them practically tamper-proof. Since these units are designed with ¼" face bars on ½" centers, they are heel and pencil proof.

**Write for comprehensive Selection Guide on these new multi-purpose Waterloo Grilles.**

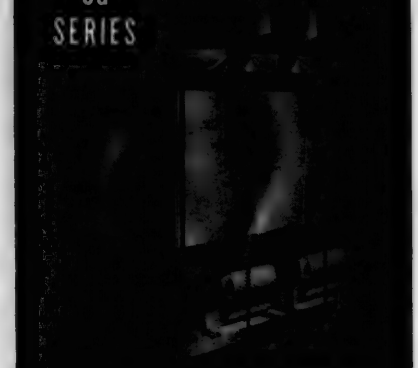



**WATERLOO REGISTER COMPANY, INC.**
**P.O. BOX 72, WATERLOO, IOWA**

WATERLOO *Air Diffusion* EQUIPMENT

WR107

"OG" SERIES



LENNOX

brings a

*New Era*

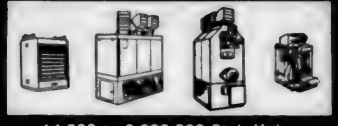
to Industrial Heating

- One Unit for Space Heating, Ventilating, Make-Up Air, Oven Applications and Drying
- Gas, Oil or Combination Burners
- Automatic or Manual Fuel Selection

Never before has one heater [illegible] so many jobs so well at such a sensible cost.

Completely packaged and factory-tested the "OG" series can be used as a central system with duct or as a unit heater installation. May be horizontal, vertical suspended or floor mounted. Dynamically balanced blower delivers a large volume of air with [illegible] action. Get the full story [illegible] write for full information [illegible] see for yourself how [illegible] make the best change in industrial heating.

LENNOX "Task Matched" Equipment to control and condition air for industry



64,000 to 2,000,000 Btuh Units

CLIP AND MAIL FOR FREE SPEC SHEETS

LENNOX Industries Inc.
INDUSTRIAL DIVISION
1701 East Euclid, Dept. AC-1,
Des Moines, Ia.

Please send me—without obligation—complete specifications and engineering data on Lennox "OG" Series Industrial Heaters

Name_____

Company_____

Address_____ City_____

Title_____

# NEW CATALOGS

*(Concluded from page 150)*

**Use the prepaid postcard on last page for securing your copies of catalogs described in this department.**

**FLEXIBLE RUBBER PIPE**—General Rubber Corp., Tenafly, N. J., offers Bulletin No. 580 on its GRC line of flexible rubber pipe. The line of Type F flanged flexible pipe described is available in standard pipe sizes from 1 to 12 inches in standard 12-inch face-to-face lengths.

Circle **Item 82** on Inquiry Card

**TUBE EXPANDER DRIVES**—Data on the company's complete line of Torq-Air-Matic automatic tube expander drives, including recently added heavy-duty Models B and C, are provided in a 6-page bulletin issued by Thomas C. Wilson, Inc., Long Island City, N. Y. A reference chart is included as an aid in selecting the right model for the right job.

Circle **Item 83** on Inquiry Card

**PORTABLE VACUUM PUMP** — Beach-Russ Co., New York, N. Y., gives complete details on its line of portable vacuum pumps in Bulletin No. 97. Both single-stage and two-stage units are available for use in dehydrating and testing refrigeration and air-conditioning equipment in the laboratory or field.

Circle **Item 84** on Inquiry Card

**ENGINE-DRIVEN FAN**—Complete specifications and construction data on a new gasoline-engine-driven centrifugal fan are presented in Bulletin 257-20 from Ilg Electric Ventilating Co., Chicago, Ill. The unit is light in weight, completely self-contained, and available in two types: gasoline and propane.

Circle **Item 85** on Inquiry Card

**CENTRIFUGAL REFRIGERATION**—A 12-page bulletin, 1100-B102, on hermetic centrifugal refrigeration systems is offered by Worthington Corp., Harrison, N. J. Bulletin contains complete information about the compressor, motor, guide vanes, impellers and lubrication system of the company's hermetic centrifugal unit. In addition to dimensional data, it also contains a chart that illustrates the various condenser and cooler water nozzle arrangements possible with two and three pass coolers and condensers.

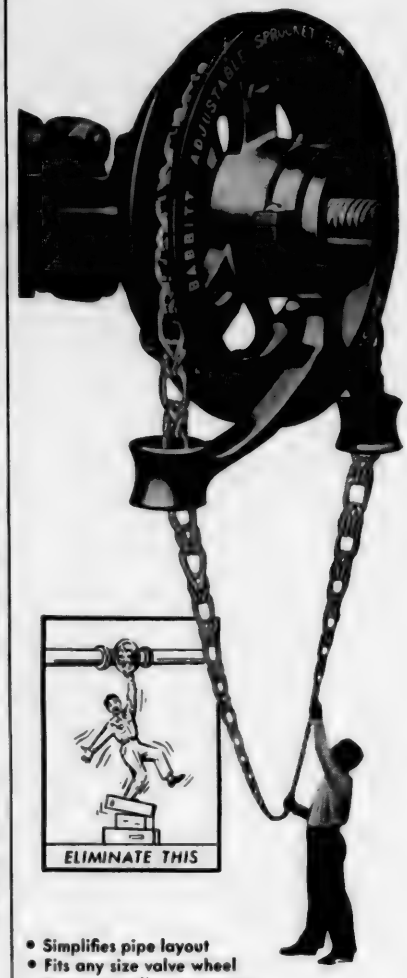
Circle **Item 86** on Inquiry Card

SAFE OPERATION OF OVERHEAD VALVES

*with a*

Babbitt

*Adjustable*
SPROCKET RIM
*with Chain Guide*




- Simplifies pipe layout
- Fits any size valve wheel
- Easy to install and operate
- Operates any valve from plant floor
- Time and money saving fixture
- No maintenance; first cost only cost
- Packed, completely assembled, one to a carton
- Hot galvanized, rust-proof chain available for all sizes
- Easy to follow instructions with each unit
- Your supplier carries complete stocks
- Write for new descriptive catalog sheet and prices

Babbitt STEAM SPECIALTY CO.

5 BABBITT SQUARE, NEW BEDFORD, MASS., U.S.A.

## 30% Savings on Labor Cost
## A Permanent Bond
## A Better, Neater Job
with

# ST. CLAIR
Specially Formulated
# INSULATION ADHESIVE

ST. CLAIR Insulation Adhesive specially formulated for bonding insulation material to metal, supersedes pins and clips, wires, screws, and caps. Provides easier, quicker handling. For bonding immediately or up to 45 minutes later.

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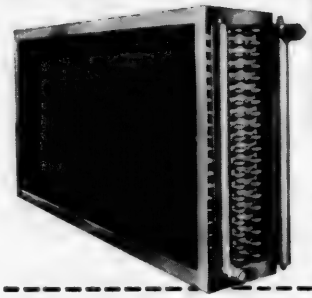
DETROIT 26, MICHIGAN

## . . . BUILT FOR *Outstanding Performance*

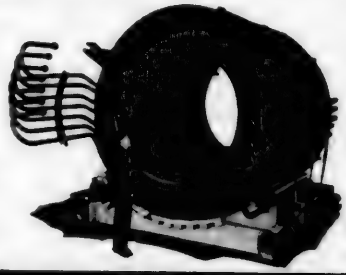


**REMPE COILS**
Designed to rigid specifications to insure long, trouble-free life.

**FIN TYPE COILS**
For Air Conditioning, Refrigeration and Heating — available in copper or steel hot galvanized — any size, any style.

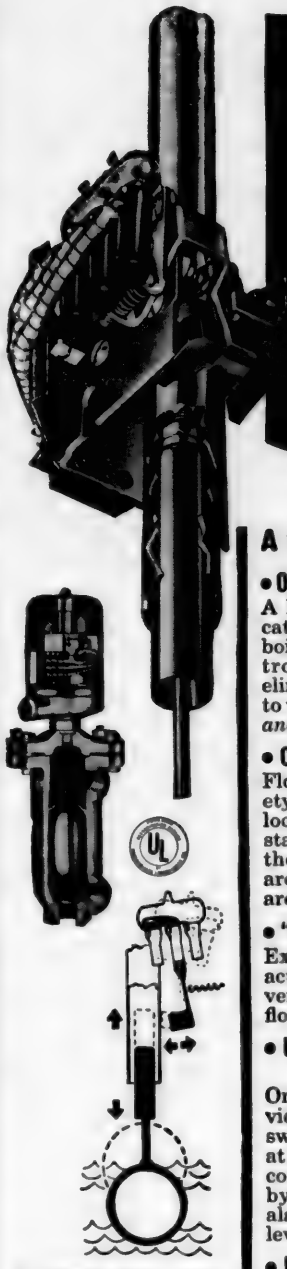
**PIPE COILS**
Complicated assemblies or production runs of coils or bends from any type of pipe or tubing.

*Send details for prompt quotation*



REMPE CO.

**REMPE COMPANY**
358 N. Sacramento Blvd.
Chicago 12, Illinois



A magnetic sleeve, raised and lowered within a non-magnetic tube, "trips" or releases an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

## WHY you are SAFER with MAGNETROL BOILER WATER LEVEL CONTROL

### A Few of MANY Reasons:

**• Operating Life Is Practically Unlimited**
A PERMANENT Alnico magnet, located *outside* the float chamber, links boiler water level and electrical controls. This simpler magnetic link eliminates mechanical parts subject to wear and fatigue failure. *Pioneered and perfected by Magnetrol.*

**• Customized Corrosion Control**
Floats can be fabricated from a variety of materials to meet any "special" local corrosion problems. Type 304 stainless steel floats have proven over the years to have the greatest all-around corrosion resistance, and so are furnished as standard.

**• "No-Scale" Float Chamber Liner**
Exclusive self-cleaning brass liner actually "flexes" off corrosion — prevents scale growth and "sticking" of float.

**• Up to Three Switches— an Exclusive Safety Feature**
Only MAGNETROL design can provide up to three completely separate switch mechanisims, each operating at its own level, in a STANDARD control. Use extra switch for "stand-by" pump for emergency use; or alarm BEFORE fuel cut-off; or high level alarm; etc.

**• Least Maintenance**
Once-a-shift blow down and once-a-month visual inspection of switch housing are only regular maintenance. *Built SAFE, Magnetrols stay SAFE.*

We offer STANDARD Magnetrol Boiler Water Level Controls for service at temperatures up to 750°F., at pressures up to 600 psi., of single stage or multi-level stage service with up to three separate switching actions. Special units available for more extreme requirements.

**MAGNETROL, Inc.** Mail the Coupon Now for Full Facts

MAGNETROL, Inc., 2106 S. Marshall Blvd., Chicago 23, Ill.

Gentlemen: Please send me Catalog Section III and full information on Magnetrol Boiler Water Level Controls.

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City_____ Zone____ State_____

FOR ANY DIFFICULT
SPOT COOLING OR HEATING
PROBLEM—SPECIFY

THERMOTANK

round type punkah louvres

More than thirty years ago THERMOTANK engineers designed, developed and installed round punkah louvres (the original jet air outlet) in ships sailing to the Far East. Since its original application in ships, the effectiveness of THERMOTANK punkah louvres has been widely used on an ever increasing variety of applications.

HERE ARE SOME REASONS WHY:

1. Finger-tip adjustment projects air stream in any desired location.
2. Provides the most effective throw for its size and pressure.
3. Ideally used for air distribution in remote areas where branch ducts cannot be accommodated.
4. Draftless, quiet operation . . . easy to balance.

THERMOTANK round type punkah louvres are recommended for any cooling, heating or ventilating requirement. For complete engineering data on round punkah louvres, ask for catalog TA-150.

THERMOTANK — AGITAIR

high velocity units • punkah louvres
air diffusers • filters • exhausters
registers and grilles

*Sold exclusively by representatives for:*

AIR DEVICES INC.

185 MADISON AVENUE, New York 16, N. Y.



balance and instrumentation rooms, animal rooms, and areas for handling radioactive materials and for special equipment such as ultracentrifuges.

The 48-bed hospital is located in four identical circular nursing units with a central area for auxiliary services. A nursing station is located in the center of each of the four circular units.

## WE INVITE DISASTER

**says Surgeon General, unless atmosphere is cleaned. Cancer-producing compounds abound in the air.**

The chief of the United States Public Health Service, Surgeon General Leroy E. Burney, told a national conference on air pollution in Washington, D. C., November 18-20, that prompt steps must be taken to cleanse the air we breathe. Although the effort "will cost big money," he said, delay would "invite disaster."

Dr. Chauncey D. Leake, assistant dean of the Ohio State University School of Medicine, said air pollution from auto exhausts is as much to blame as cigarettes for increasing lung cancer.

• **EARTH GETTING HOTTER:**—Dr. Leake, representing the American Association for the Advancement of Science, said the increase in air pollution also is making the earth hotter.

"What will we do if this occurs with gradual melting of the huge polar ice caps, and the gradual rise of our oceans, drowning out still further our shorelines?" he asked.

• **FACTORS**—The various physical-chemical factors involved in air pollution include dusts, some of which are radioactive, soot, carbon particles, ash, oxides of carbon, of sulfur, of nitrogen, and of many metals, mixed hydrocarbons, aldehydes, ketones, organic acids, and the highly irritating ozone," said Dr. Leake.

"Under the action of sunlight, heat, water vapor, and atmospheric conditions, a complex of organic compounds may develop, some of which are carcinogenic. Ozone and the compounds which it can produce may cause wide-spread trouble for all living things in the area, with local irritation of eyes, of nose, and respiratory organs. These may also injure all growing things, and cause damage to machinery, and to any type of rubber material. These may act in very small concentrations, involving only a few parts per million of air. What may happen if the concentrations tend to increase?

"Mendenhall and his associates from Cincinnati find that tolerance develops to the acute effects of ozone and of ketene, but how about the danger of continuing inhalation of small amounts of these toxic agents every minute of every day, year after year?

"Most of air pollution is referable to combustion. This was realized centuries ago. England had laws regulating the burning of coal in the early 19th Century. Air pollution from burning has nevertheless steadily increased with industrialization. Now, however, as Haagen-Smit shows, about half of air pollution is referable to exhausts from internal combustion engines in automobiles. Here is a challenge.

"In Seattle, autos and trucks dump 100 tons of hydrocarbons, 320 to 80 tons of nitrogen dioxide, and four

tons of sulfur dioxide into the city's air every day. When are the auto and truck manufacturers going to turn from the foolishness of fins, from silly style whims, from over-sized models, and from too much horsepower, to the essential but tough job of controlling exhausts?

"This is a pressing matter to each of us personally, and to our community society. In addition to eye and respiratory irritation, the increasing incidence of lung cancer is quite as referable to increased city auto traffic exhausts as to cigarettes. Russian public health officials, I learned a couple of years ago, claim their rising occurrence of lung cancer in the cities goes along with the increase of auto and truck traffic."

Dr. Leake, Dr. Burney and other speakers called on 1,000 scientific experts and civic leaders attending the sessions to explore methods for reducing air pollution.

• **PRESIDENT'S GREETING**—President Eisenhower, in greeting the group, said:

"To maintain our industrial and scientific progress without impairing the purity of the air we breathe is of primary concern to the nation. Government, industry and individual citizens have mutual responsibility in this vital area."

• **LUNG CANCER**—Dr. Burney said it would cause unnecessary suffering to wait for absolute proof of a relationship between air pollution and lung cancer.

"We know that lung cancer death rates in the largest cities are twice as high as those in non-urban areas," he said. "The case has not yet been proved, but the weight of circumstantial evidence grows as research progresses."

Cancer-producing agents "are in the air we breathe," he said, and cancers can be produced in animals by using concentrates of city smokes.

He said studies also show that cities with heaviest pollution loads "tend to rank high in death rates for a number of diseases."

The three-day meeting was called by Dr. Burney to get expert opinions on how to prevent air contamination. The conference aimed at awakening interest in the air-pollution problem, which costs the public an estimated $1,500,000,000 to $4,000,000,000 a year, not counting damage to health. The hope is to develop a ten-year plan to cope with air pollution, which Dr. Burney called "an unwanted by-product of progress."

Dr. Herman E. Hilleboe, Commissioner of Health for New York State, detailed how State and local health officials must plan carefully to obtain local support for their program for attacking air pollution. He said, however, that men and funds are so difficult to obtain at the State and local level that one approach to be considered is a "crash program" by the Public Health Service to furnish trained personnel to the States, similar to the venereal disease and tuberculosis efforts of some years ago.

• **LOS ANGELES PROTESTS**—Spokesmen from the auto industry reported that their companies are working on exhaust control devices. But delegates from smog-ridden Los Angeles complained that the industry was not doing enough.

The delegates specifically urged the industry to more vigorous efforts in one of a series of resolutions they passed at the close of their conference.


FOR EXTREMELY LONG THROWS OF AIR IN LARGE AREAS OF ANY ENCLOSURE

THERMOTANK

drum type punkah louvres

Drum type punkah louvres originated by THERMOTANK engineers combine design and performance features that make them ideally suited for installation in large enclosures where extremely long throws are required.

THERMOTANK drum type punkah louvres are engineered to provide both horizontal and vertical control of the air stream. In addition, control of length of throw and its location is made possible by the rotating drum feature and adjustable vane design.

THERMOTANK drum type punkah louvres can be mounted in either a horizontal or vertical position without affecting the distribution of air from the outlet. This feature offers the architect and engineer unlimited application possibilities and does not restrict the location of the punkah louvres.

THERMOTANK drum type punkah louvres are highly recommended for installation in missile manufacturing plants, automobile assembly plants, aircraft plants, airport terminals, gymnasiums, arenas, in fact, any large enclosed area where air movement must be correctly distributed.

For complete engineering data on these punkah louvres, ask for catalog TA-150.

THERMOTANK — AGITAIR

high velocity units • punkah louvres
air diffusers • filters • exhausters
registers and grilles

*Sold exclusively by representatives for:*

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185 MADISON AVENUE, New York 16, N. Y.

ROOM BY ROOM D-H FAN-COIL

"SPOTAIRE"

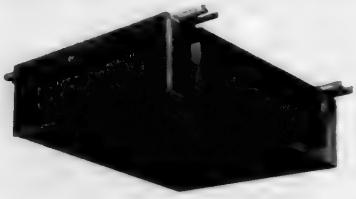
FILTER UNITS FOR NEW OR

DRAYER

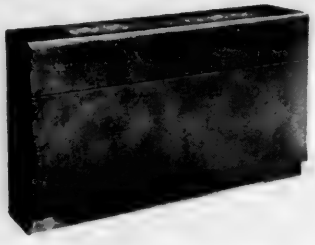
OLD CONSTRUCTION ARE

HANSON

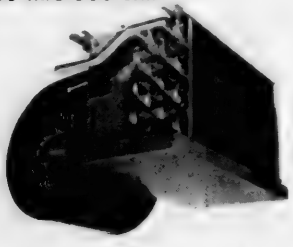
TRULY QUIET BEYOND BELIEF!



LRC's . . . basic unit, concealed or deluxe cabinet (200 thru 600 cfm)



VRC's . . . concealed or deluxe consoles (200 thru 600 cfm)



HRC's . . . three suspended types (300 thru 1750 cfm)

NEED LITERATURE?

drayer-hanson

DIVISION NATIONAL U. S. RADIATOR CORP.

3301 MEDFORD STREET
LOS ANGELES 63, CALIFORNIA
CABLE: CLICONI LOS ANGELES



The conference also recommended the indefinite continuation of the Federal air pollution program, now scheduled to expire on July 1, 1960. Under the program, the Federal government provides research and technical services to the states and local communities.

Arthur S. Flemming, Secretary of Health, Education and Welfare, promptly assured the delegates that he will ask Congress next year to extend the program.

## SPOT-TEST WINDOWS

**for wind and rain leakage at velocities to 100 mph. Over one thousand special windows for Newark tower.**

What are believed to be the most severe tests to which skyscraper windows ever have been subjected, are being applied to 1,710 specially designed units that will be installed in the 24-story tower building of the Prudential Insurance Company, now under construction in Newark, New Jersey.

According to Vermilya-Brown Company, Inc., New York, N. Y., general contractor, one window out of every hundred, picked at random, is being wind and rain tested for leakage at velocities up to 100 mph. Following this, the rotatable section of each window is being tested for wear by being revolved 5,000 times, manually, by a team of men relieving each other. The windows are then given a second series of wind and rain tests.

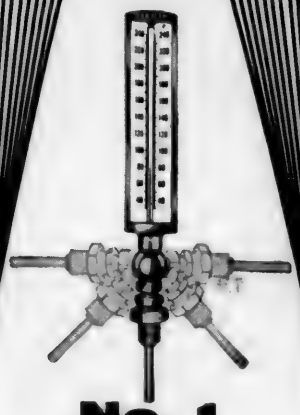
The windows are aluminum frame units approximately 4 by 10 ft. Each has a center section that may be completely revolved. The movable section, which is 4 ft. wide and varies from about 5 to 7 ft. in height, is insulated glass, a sandwich of two panes of ¼-inch thick glass with a space between, from which all the air has been exhausted and a permanent vacuum created.

• **INFILTRATION TESTS**—Initial air infiltration tests are conducted with static pressure equivalent to a wind velocity of 50 mph. This is maintained in the pressure chamber by means of a large aircraft-type supercharger. Air passing through the window unit enters the collection chamber and is discharged to the atmosphere through a small orifice plate. Pressure across the window unit and across the orifice is measured by means of highly sensitive Emsweiler type pressure gauges.

The initial water leakage test comes next. It is made with a continuous film of water maintained over all cracks and openings in the unit by means of perforated pipes located in front of the window unit and inside the pressure chamber. With water flowing, the equivalent static air pressure across the unit is maintained for successive 15-min. intervals at 75, 87½ and 100 mph. There is no lessening of water application or applied pressure during the transition to the next higher pressure condition. If any water passes through the unit, it is collected and measured and all visible leakage points at the interior face are noted.

The wear test is then given, consisting of approximately 5,000 180-deg. turning cycles of the center movable section, performed manually, after which the air infiltration and water leakage tests are repeated.

*(News of the Month concluded on page 158)*



# No. 1 SPACE STRETCHER

"Inner space" problems are sometimes more baffling to engineers, architects and contractors than those concerned with "outer space."

That needed inch or two amid the usual maze of pipe, conduit, tube and cable is worth its size in gold!

Where space is a factor, that's the place for Weksler ADJUST-ANGLE* Thermometers. These versatile instruments, supplied in four case sizes, meet every installation requirement. The exclusive Weksler ADJUST-ANGLE feature permits positioning of stem or case to fit any space.

MORE THAN A HUNDRED THOUSAND ADJUST-ANGLE INSTALLATIONS!

Write for complete information.

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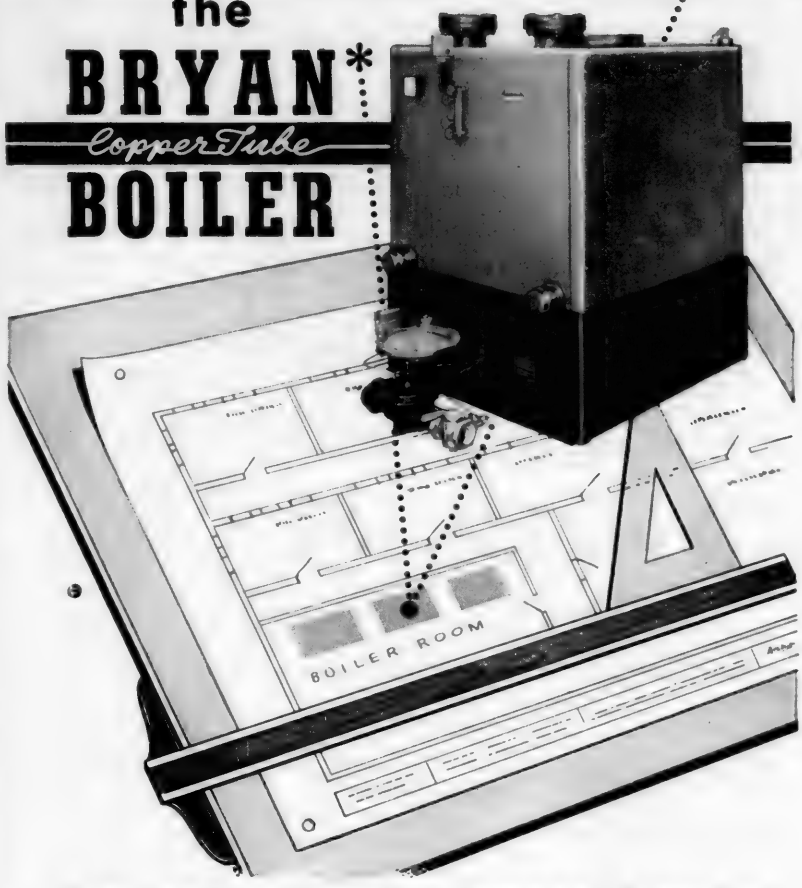
FREEPORT, L. I., NEW YORK
INDICATING AND RECORDING INSTRUMENTS FOR TEMPERATURE, PRESSURE AND HUMIDITY



# to FIT the JOB*

the **BRYAN*** *Copper Tube* **BOILER**




***For every steam or water heating application up to 1,800,000 B.T.U. output.***

Whether the plans on your boards are for a factory, apartment house, swimming pool or a modest radiant heat home, a detailed check on specifications will point to one of the many Bryan models covering low or high pressure steam, hot water boilers, or indirect water heaters.

The Bryan is a heavy duty, durable boiler made to deliver a lot of B.T.U's in a short period of time. Specially engineered for gas or oil heating, its high efficiency is complemented by years of trouble free service. Requires minimum floor space.

Bryan is the originator of the famous Bryan copper tubes. They are used in both direct and indirect heating units for fast action and elimination of scale deposits.

Bryan Gas Fired Boilers are designed and built to the requirements of the A.S.M.E. code and are also approved by the American Gas Association (A.G.A.)

**Send For Technical Information • 2100 Chili Pike**

**BRYAN STEAM CORPORATION • Peru, Indiana**

FOR LOW COST HEATING PLANT POWER-DRAFT AND INDUSTRIAL EXHAUSTING

Patent No. 2,722,372. Other Patents Pending.

...Specify

**Quickdraft**

★ NO MOTORS, FANS OR BEARINGS IN EXHAUST LINE ★ NEEDS NO STACKS ★ ACID RESISTING FINISHES ★ STATIC PRESSURE UP TO 60 INCHES

FOR HEATING PLANTS AND INCINERATORS, Quickdraft provides constant draft for efficient and economical combustion. It eliminates pulsating or chattering, puffing, smoking and sooting. Costly, tall and unsightly stacks are unnecessary.

FOR INDUSTRY, Quickdraft now offers from ¼-inch to 60-inches static pressure for exhausting corrosive gases, abrasives and paint spray . . . moving fine bulk materials and wastes.

FOR MOVING AIR . . . in or out of building through ducts . . . Quickdraft is outstanding.

N-648-QD

IMPORTANT NOTICE

For withstanding corrosive gases, all Quickdraft units are available in standard acid resisting vitreous enamel, No. 316 Stainless Steel, rigid plastics (P.V.C.) and with plastic and Fiberglas coatings.

*Write for QUICKDRAFT ENGINEERING DATA on your application . . . today.*

**Quickdraft** CORPORATION P. O. Box 87-O Canton 1, Ohio

## RED HOT MOTOR

**Even when almost "broiled" in the searing heat from jets of burning gas, this experimental electric motor performs efficiently enough to do useful work, such as this grinding job. The motor was built to test the performance of a new system of inorganic electrical insulation for high-temperature motors, transformers, and other apparatus. It has operated continuously more than 100 hours, with no indication of insulation deterioration when sealed inside an oven at 950 deg F. The new insulation, developed by scientists in the materials engineering departments of Westinghouse Electric Corp., Pittsburgh, Pa., offers promise for use in the electrical equipment in supersonic planes, rockets, and missiles.**

**Canadian Degree-Days for November, 1958***

| City | November | | Cumulative | |
|---|---|---|---|---|
| | 1958 | Normal | 1958 | Normal |
| Calgary, Alta. | 1159 | 1110 | 2209 | 2230 |
| Charlottetown, P. E. I. | 876 | 850 | 1770 | 1640 |
| Crescent Valley, B. C. | 1029 | 990 | 2121 | 2000 |
| Edmonton, Alta. | 1220 | 1220 | 2334 | 2410 |
| Fort William, Ont. | 1059 | 1170 | 2024 | 2280 |
| Grande Prairie, Alta. | 1329 | 1300 | 2588 | 2550 |
| Halifax, N. S. | 722 | 745 | 1426 | 1404 |
| London, Ont. | 763 | 840 | 1405 | 1480 |
| Medicine Hat, Alta. | 1119 | 1070 | 1993 | 1970 |
| Moncton, N. B. | 932 | 910 | 1892 | 1760 |
| Montreal, P. Q. | 830 | 910 | 1547 | 1650 |
| North Bay, Ont. | 975 | 1080 | 1941 | 2070 |
| Ottawa, Ont. | 872 | 970 | 1679 | 1750 |
| Penticton, B. C. | 897 | 820 | 1656 | 1540 |
| Prince George, B. C. | 1197 | 1110 | 2390 | 2320 |
| Quebec City, P. Q. | 988 | 990 | 1997 | 1930 |
| Regina, Sask. | 1136 | 1290 | 2191 | 2410 |
| St. John, N. B. | 882 | 880 | 1842 | 1830 |
| Saskatoon, Sask. | 1361 | 1320 | 2457 | 2460 |
| Timmins, Ont. | 1104 | 1270 | 2255 | 2460 |
| Toronto, Ont. | 706 | 777 | 1268 | 1396 |
| Vancouver, B. C. | 688 | 650 | 1338 | 1310 |
| Victoria, B. C. | 655 | 600 | 1336 | 1240 |
| Windsor, Ont. | 717 | 780 | 1226 | 1310 |
| Winnipeg, Man. | 1238 | 1255 | 2178 | 2252 |

* These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.
The Department reports a slight revision in the figure for October as published in last month's issue. Corrected figure is Crescent Valley, B. C., 729.

THE **weil** TVC

New *Condensate Pumps*

**Features:**
Low speed (1750 RPM) TVC pumps are easily installed in areas where space is important. Their compact cast iron receiver and sturdy pumping unit assure a trouble-free installation.

**Dimensions:**
26 gallon cast iron receiver for single or duplex units: Diameter 25"; height of return above floor 10½"; height of unit 36" max.

**Installation:**
Simple installation: one return connection, one discharge connection. Unit is completely assembled at the factory. Send for Bulletin TVC-300.

**Send for Bulletin TVC-300**

See Catalog in 1959 Sweet's and 1959 Domestic Eng. Cat. Dir.

*Available from Jobbers Stocks!*

## TVC PUMPS now available in capacities from 750 to 15,000 sq. ft. E.D.R.

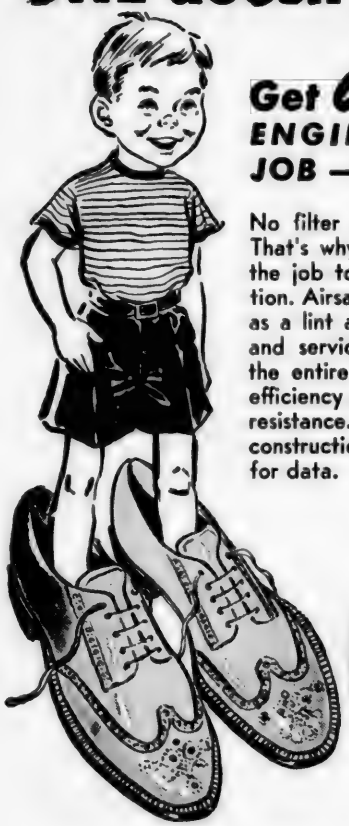
The three sizes of TVC receivers now offer a complete line of low pressure system condensate pumps to fit all requirements. The LOW RETURN CONNECTION and LOW SPEED — 1750 R.P.M., coupled with the built-in durability, operating efficiency and low cost of these pumps guarantee a satisfactory and trouble free installation. This pump provides gravity drainage for low heating units.

Specify and install a **weil** TVC Pump.

*Built for ONE MILLION STARTS . . . without attention*

**1516 North Fremont Street • Chicago 22, Illinois**

# ONE doesn't fit ALL needs!



## Get *Airsan* Filters *ENGINEERED TO FIT THE JOB — RIGHT EVERY TIME*

No filter does all jobs, meets every need. That's why Airsan Filters are engineered to the job to offer more effective dust collection. Airsan's expanded metal face plate acts as a lint arrestor to provide easier cleaning and servicing. It distributes air easily over the entire filter area. Provide high filtering efficiency and dust holding capacity with less resistance. Features include all galvanized construction and welded lock corners. Write for data.

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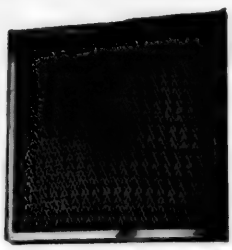
AFI MEMBER AIR FILTER INSTITUTE

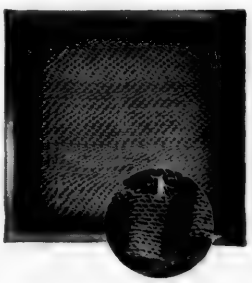
### *AIR FILTERS*
*(Low Velocity)*

Viscous type, permanent and cleanable designed for industrial, commercial and domestic use. Available in 1" and 2" thickness.



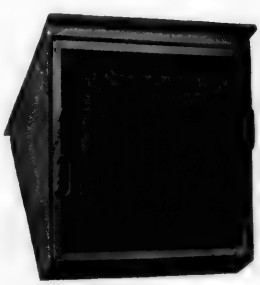
### *VIRO-CRIMP*
*(High Velocity)*

Has a specially designed high velocity Viro-Crimp filter core. Hemmed edges provide a safety feature. Operates efficiently at 300 to 500 fpm. Available in 2" and 4" thickness.



### *GREASE FILTERS*

Permanent, cleanable type Airsan Grease Filters made especially for range canopies, galleys, kitchens. Available in 2" thickness.



## Air Filter Corporation

**4554 S. West Woolworth Ave. • Milwaukee, Wis.**

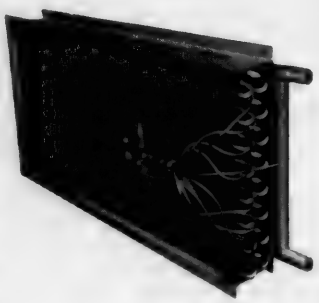
*Canadian Representative*

**DOUGLAS ENGINEERING CO., LTD., TORONTO**

*A Few Distributorships Available. Write for Details!*

**. . . another outstanding application of THERMAL Cooling and Heating Coils**

Specifications for the cooling and heating coils in the main air conditioning system of the new ultra-modern *House of Tomorrow Musical Theater in Fort Worth called for not only top quality but fast delivery. Thermal Engineering delivered both.



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DIRECT EXPANSION COIL

Thermal Engineering Corporation of Houston manufactures central plant air conditioners, multi-zone air conditioners, cooling and heating coils, sprayed coil units, heating and ventilating units and air cooled condensers—all famous for long life, efficient operation and prompt delivery. When you want **tomorrow's** air conditioning and ventilating equipment today—specify Thermal.

***Architect: A. George King & Assoc., Fort Worth***
***Mechanical Engineers: Leonard E. Kanto & Assoc., Fort Worth***
***Mechanical Contractor: Bird Plbg. & Heating Co., Fort Worth***

**See our exhibit at the 14th International Heating & Air Conditioning Exposition, Convention Hall, Philadelphia, January 26-29, 1959, Booth #16.**

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# BOOK REVIEWS

*Publications abstracted in this department should be ordered direct from publisher.*

## FUNDAMENTALS OF PIPE DRAFTING

Although there are many textbooks on drafting, a more specialized treatment is required for those interested in pipe drafting. This field of drawing is presented in Fundamentals of Pipe Drafting, by Charles H. Thompson, associate professor, head of the Drafting and Design Department, The Technical Institute, College of Engineering, Oklahoma State University.

This book represents the type of information found helpful to the student, after ten years of experience by the author in teaching pipe drafting. Subject matter of special interest to the engineer has been omitted in order to concentrate on the details necessary for the draftsman.

*Fundamentals of Pipe Drafting, by C. H. Thompson. Paper bound, 8-1/2 x 11 inches, 66 pages. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $3.50.*

• • •

THE UNFIRED PRESSURE VESSEL CODE SIMPLIFIED—Although the new 1956 ASME Unfired Pressure Vessel Code contains a large amount of information, one who uses this code infrequently may find it difficult to locate the necessary information. To assist those who wish to find specific information quickly, Robert Chuse has written The Unfired Pressure Vessel Code Simplified. It consists of 48 pages and many simplified charts. For a copy write to Robert Chuse, P. O. Box 91, Leonia, N. J. Price, $6.50.

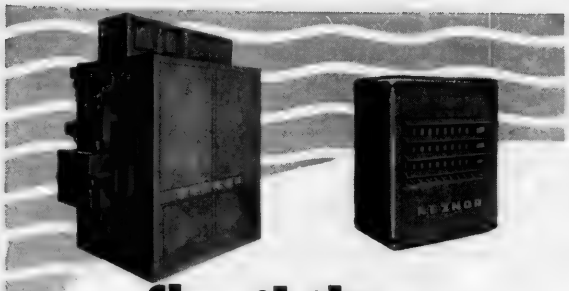
COOLING TOWERS—Results of a 7-year field research program by Cooling Tower Institute is covered in Bulletin PFM-110. It explains the development of a recirculation factor. This bulletin presents a simple procedure to make reasonable and adequate allowances for recirculation in selecting design conditions for mechanical draft cooling towers. Cooling Tower Institute, 420 Emerson St., Palo Alto, Calif.

# COMING EVENTS

**Where listed, names or titles of individuals are those from whom further information is available**

**AUTOMATIVE ENGINEERS MEETING**—1959 annual meeting and engineering display of the Society of Automotive Engineers, Inc., at The Sheraton-Cadillac Hotel and Statler Hotel, Detroit, Mich. Secretary of the Society, 485 Lexington Ave., New York 17, N. Y. . . . . **JANUARY 12-16, 1959.**

**NOISE CONTROL CONFERENCE**—Under the auspices of the Building Research Institute, a conference on Noise Control in Buildings will be held at the Hotel New Yorker, New York, N. Y. Harold Horowitz, technical secretary, National Academy of Sciences, 2101 Constitution Ave., Washington 25, D. C. . . **JANUARY 14-15, 1959.**



# flexibility

When you're faced with the choice of specifying a boiler which is oversized for initial steam heating requirements or one which won't have the reserve capacity to heat possible future additions, the best solution is a switch to Reznor gas unit heaters. As a building grows, a Reznor heating system grows with it, easily and efficiently. As more space is added, more heaters can be installed. It's as simple as that.

FLEXIBILITY is only one of many reasons why Reznor gas unit heating is right for so many of your commercial and industrial jobs. Ask your Reznor distributor for the complete story or write for your copy of "Modern Heating".

Look for Reznor under 'Heaters-Unit' in the Yellow Pages

REZNOR
WORLD'S LARGEST SELLING DIRECT FIRED
UNIT HEATERS

Reznor Manufacturing Company, 64 Union Street, Mercer, Pa.

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FOR THE MOST UP TO DATE MATERIAL ON

# RADIANT HEATING

All you need to know about the design and installation of all types of radiant heating systems.

Step-by-step procedure, general information, design formulas and working data combine to give you the facts you need in designing and installing effective systems. All formulas have been reduced to the simplest terms. Typical problems are solved by the application of the easy-to-use charts and tables—without calculation.

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## NEW! EXTRUDED ALUMINUM SHUTTERS

Shutters of modern design which give you ALL of these features: Lightweight, Full Weather Strip, Low Freight Cost, Easier installation, Concealed Pivot Pins, Rust and corrosion Proof and Natural aluminum finish with fluted frames.

Write for complete specifications.

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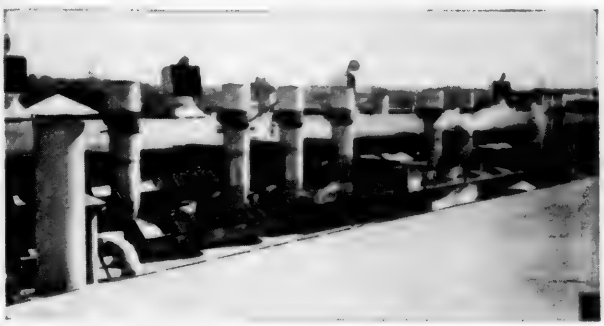
# the downturn

# and upturn at KVP



Same picture – different setting. Top shows complicated, space-wasting duct system which routed fumes back into plant for discharge through stacks. Bottom shows nine new 36" Aerovent "SP-7" Duct Fans installed to take fumes *up* and *out*, saving valuable floor space in busy working area. Just one of hundreds of successful Aerovent installations characterizing modern air engineering in action.

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All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

Aerovent FANS

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ASH and BRANDT STS. • PIQUA, O.

Member Air-Moving and Conditioning Assn. (AMCA)

*The Eagle Who Became A Pigeon*

**O**nce upon a time ...

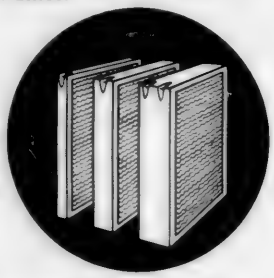
there was a high flying eagle who had a very humbling experience. The permanent panel air filters he had selected because of their bargain prices began to fall apart after only a few months of service. Realizing he had been taken for a pigeon, he let out a horrible scream.

Meanwhile, back at the aerie, his friendly Far-Air man was feathering Mr. Eagle's nest with samples of the "E Pluribus Unum" of permanent panels ... the Far-Air High Velocity Filter.

When he returned, his eagle eye fell upon the Far-Air Filters. He saw they were built to last and offered unexcelled performance. Ah, here at last were quality filters he could be proud to specify! He's been flying high ever since.

*Moral:*

*Compare before you specify! Swoop down on a beak-full of facts about Far-Air Filters. Send the coupon below homing to us.*



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P.O. BOX 45187 AIRPORT STATION
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*Keep 'em Flying! Airmail me Bulletin B-100-2B covering Far-Air High Velocity Filters.*

NAME_____

TITLE_____

COMPANY_____

STREET ADDRESS_____

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*(Continued from page 160)*

**EXPOSITION AND ASHAE CONVENTION**—65th annual meeting, American Society of Heating and Air-Conditioning Engineers (Jan. 26-29, 1959) and 14th International Heating and Air Conditioning Exposition, Philadelphia, Pa. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. ...**JANUARY 26-30, 1959.**

**HOME PRODUCTS SHOW**—Home Improvement Products Show (HIPS), to be held at the Coliseum, New York, N. Y. Ted Black Agency, Medical Arts Bldg., Reading, Pa. ..**FEBRUARY 4-6, 1959.**

**INDUSTRIAL VENTILATION CONFERENCE**—8th annual conference on Industrial and Mining Ventilation, sponsored by the Division of Occupational Health, Michigan Department of Health; and the Department of Mechanical Engineering and Continuing Education Service of Michigan State University, to be held at Kellogg Center for Continuing Education, Michigan State University, East Lansing, Mich. Write to the University for details. **FEBRUARY 16-19, 1959.**

**WESTERN METAL EXPOSITION**—Eleventh Western Metal Exposition and Congress, of the American Society for Metals, at the Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif. R. Y. Bayless, assistant secretary of the Society, 7301 Euclid Ave., Cleveland 3, Ohio. .....**MARCH 16-20, 1959.**

**GAMA MEETING**—Annual meeting of the Gas Appliance Manufacturers Association, at the Americana Hotel, Bal Harbour, Fla. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. .....**APRIL 1-3, 1959.**

**NUCLEAR CONGRESS**—1959 Nuclear Congress, sponsored by the Instrument Society of America and coordinated by Engineers Joint Council, to be held in Cleveland, Ohio. Headquarters to be announced later. Burns & Roe, Inc., 160 West Broadway, New York 13, N. Y. .....**APRIL 5-10, 1959.**

**OHI CONVENTION**—37th annual convention of the Oil Heat Institute of America, Inc., at the Olympic Hotel, Seattle, Wash. Secretary, OHI, 500 Fifth Ave., New York 36, N. Y. .....**APRIL 28-MAY 2, 1959.**

**NDHA CONVENTION**—50th annual meeting of the National District Heating Association, Skytop Lodge, Skytop, Pa. Secretary-Treasurer, John F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh 6, Pa. .....**JUNE 1-4, 1959.**

**ASHAE MEETING**—Semi-annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., in Vancouver, B. C., Canada. Headquarters to be announced later. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 17, N. Y. .....**JUNE 7-11, 1959.**

**ASTM MEETING**—Annual meeting of the American Society for Testing Materials, at Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. .....**JUNE 21-26, 1959.**

**ASRE MEETING**—Annual meeting of the American Society of Refrigerating Engineers, at the Lake Placid Club, Lake Placid, N. Y. Secretary of the Society, 234 Fifth Ave., New York 1, N. Y. .....**JUNE 22-24, 1959.**

**ISA INSTRUMENT-AUTOMATION EXHIBIT**—14th annual Instrument-Automation Conference and Exhibit of the Instrument Society of America, at the International Amphitheatre, Chicago, Ill. H. S. Kindler, ISA, 313 Sixth Ave., Pittsburgh 22, Pa. .....**SEPTEMBER 21-25, 1959.**

**ASRE CONVENTION**—Semi-annual meeting of the American Society of Refrigerating Engineers, at the Hotel Traymore, Atlantic City, N. J. R. C. Cross, secretary of the Society, 234 Fifth Ave., New York 1, N. Y. .....**OCTOBER 30-NOVEMBER 1, 1959**

**ARI EXPOSITION**—11th Exposition of the Air-Conditioning and Refrigeration Industry at Convention Hall, Atlantic City, N. J. Geo. S. Jones, Jr., managing director of Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. .....**NOVEMBER 2-5, 1959.**

**ASHAE MEETING**—66th annual meeting of the American Society of Heating and Air-Conditioning Engineers, and the 2nd Southwest Heating and Air-Conditioning Exposition, sponsored by ASHAE, in Dallas, Tex. The meeting will be at the Baker and Adolphus Hotels, and the Exposition in the Memorial Auditorium. Secretary of the Society, 62 Worth St., New York 13, N. Y. ..**FEBRUARY 1-4, 1960.**

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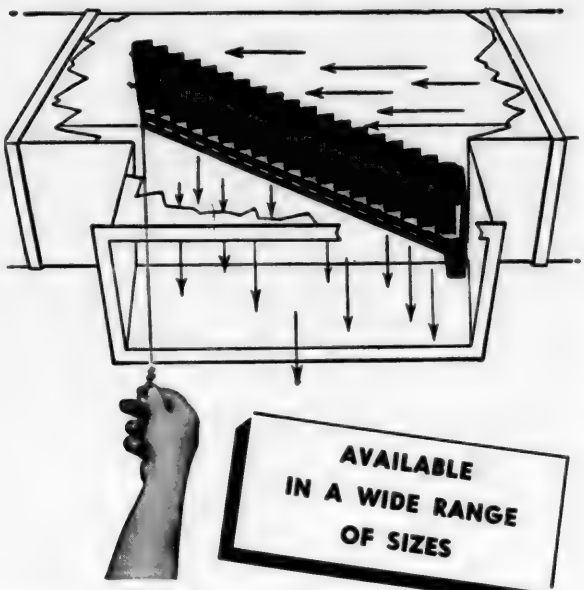
A-J

# AIR "EXTRACTOR"



This new A-J Air Extractor gives you maximum control of any forced air system. It's not a "damper type" control to meter *available* air flow through a grille, but a "scoop" that diverts air from the main duct to branch ducts or grilles and *increases* output over normal flow where needed.

The curved steel blades of the A-J Extractor are adjustable and act in unison to provide a controlled and uniform flow of air into branch ducts. A single key rod provides fast and easy adjustment through the face of a grille or register, and eliminates need for removal. The extractor is sturdily constructed, and fastened in the duct with two screws. Velocity of the air will not alter setting. Write for full information and prices.

**AVAILABLE IN A WIDE RANGE OF SIZES**

**FREE Catalog**

listing, describing and pricing 1,000 types and sizes of grilles, registers, etc.

## A-J MANUFACTURING Co.

**3601 E. 18th St. Dept. V1 Kansas City 27, Mo.**

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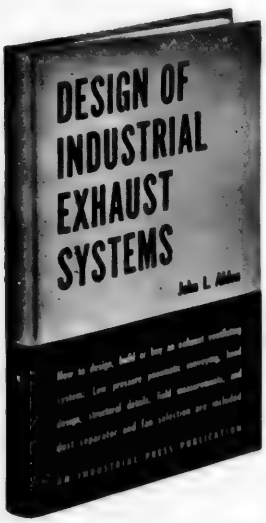
# THE ABC's OF INDUSTRIAL EXHAUST SYSTEMS




**How To Design, Build or Buy Efficient Industrial Exhaust Systems**

All in one convenient volume—everything you need to know to design, build or buy an industrial exhaust system that meets the demands of the industrial hygiene expert and the law. DESIGN OF INDUSTRIAL EXHAUST SYSTEMS presents the facts about the various types of exhaust systems for the removal of dust, fumes, vapors, gases, steam. Concise information is also included on low pressure conveyors for carrying bulky materials, such as gain or sawdust, by air stream.

You can design practically any type of exhaust system completely from the information this book contains—without using any other references. Send for it today!

**2nd Edition Completely Revised**

**$3.50**

In Canada or overseas, $4.25

**252 Pages**

**120 Drawings, Charts and Diagrams**

## THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

**THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.**

Please send me ..... copies of Design of Industrial Exhaust Systems.

☐ Check or money order is enclosed. Send book(s) postpaid.

☐ Send book(s) and invoice, including postage. I will pay within five days if I decide to keep the book(s).

☐ Bill me ☐ Bill company

Name .....

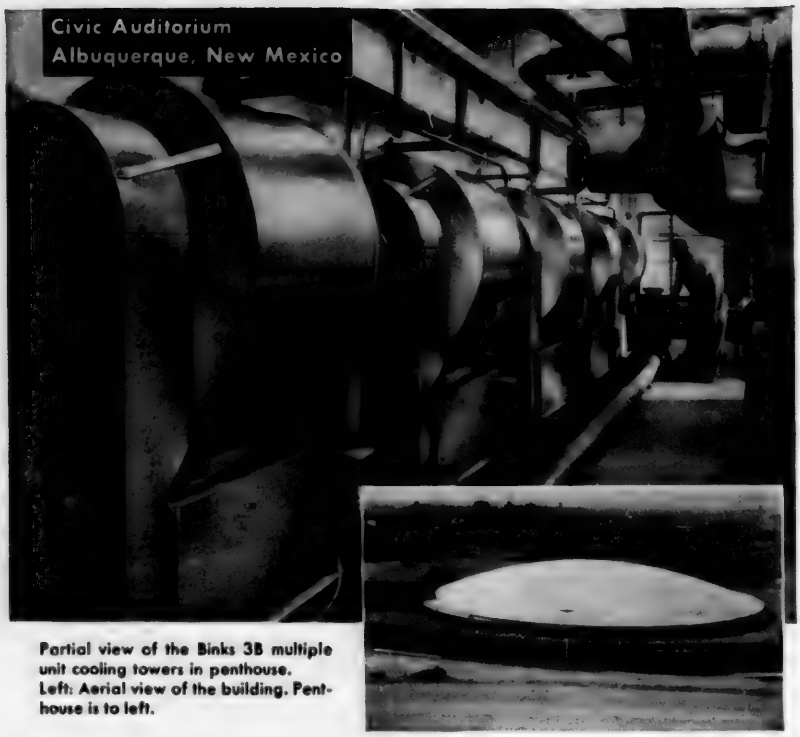
Company .....

Company Address .....

City ..... Zone .... State .....

Home Address .....

(Please fill in if you want book sent to your home) ACH&V/1/59




Partial view of the Binks 3B multiple unit cooling towers in penthouse. Left: Aerial view of the building. Penthouse is to left.

# COMPACT, QUIET, EFFICIENT...

## Binks cooling towers solve 3 problems

"Space was at a premium, noise could not be tolerated, and cooling load demands varied greatly." These were the cooling tower selection problems faced by Dr. Marcello Giomi, consulting engineer on the Civic Auditorium in Albuquerque, New Mexico.

**All cooling equipment in penthouse.** Clean architectural lines of the building made it essential to house all cooling equipment within the basic structure. The compactness of the Binks 3B series cooling towers made sense.

**Towers right next to audience.** Only a few feet separate the towers from the audience. The squirrel cage blowers and dynamic and static balanced moving parts operate almost silently . . . cannot be heard even during the hushed quiet of a violin concert.

**Handle all cooling loads.** Variable outside temperatures and audience size meant designing for many cooling loads. Independent blower operation and scientifically balanced air-to-water ratios provide complete load-matching flexibility and highest cooling efficiency under all conditions.

**Send for free bulletins.** Learn all the many design and operating features of Binks cooling towers. Ask your nearest Binks Branch Office, or write direct, for a copy of Bulletins 477-A and 333. Binks engineers will be glad to answer your questions and help solve your particular cooling problems. There is no obligation.

9027

**Binks**
*EVERYTHING FOR WATER COOLING*

**VISIT BOOTH 35**

14th International Heating and Air Conditioning Exposition
January 26-29, 1959
Philadelphia, Pennsylvania

**Binks Manufacturing Company**
3120-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

# CLASSIFIED ADVERTISING

Sold at $12 per column inch.

### MANUFACTURERS' AGENT

Territories still available for "live wire" Manufacturing Agent, anxious to cash in on a growing market in a substantial manner. The Newest-Latest line of Combined Heating, Cooling and Ventilating equipment for hot and chilled water. Line includes Fan Coil Units, Chillatrons (water chillers) and accessories, Grilles, Filters and Controls. Our half Century of manufacturing experience in heat transfer products gives you a background of reliability and quality that puts you in every Architect and Engineer's office. Write now requesting territory.

**KRITZER PRODUCTS**
DIVISION OF PEERLESS OF AMERICA, INC.
ATTENTION: MR. M. W. KNIGHT
5800 North Pulaski Road, Chicago 46, Ill.

PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply BURNER SERVICE form in 8 part EZE-SNAP with 3 carbons in each set, 1200 sets imprinted with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N. Y.

### MANUFACTURERS' AGENTS

An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturer's agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.

Please reply Box 914, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

### We Need Your Help to Give You Better Service

Please include your CITY POSTAL ZONE NUMBER in your address when writing to us about . . .

. . . your present subscription
. . . renewing your subscription
. . . ordering new subscriptions.

We have pledged to the Post Office Department that we will cooperate with them to help achieve the most economical and efficient means of delivering your magazines. To do this we must include the postal zone number for subscribers' addresses in all zoned cities. If your address has a postal zone number, use it at all times.

AIR CONDITIONING, HEATING AND VENTILATING
93 WORTH ST., NEW YORK 13, N. Y.

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*Advertiser appeared in preceding issue




HUGHES PRINTING CO.
EAST STROUDSBURG, PA.

# How Centralized Remote Control Completes an Air Conditioning System

**With centralized remote indication, adjustment, and recording, the system accomplishes what it is designed to do... costs less to operate and maintain ...and delivers continuous complaint-free comfort**

Complaints about room temperatures usually are a result of poor *management* of the heating-ventilating-cooling system.

When controls are located in the various controlled zones, proper adjustment is time-consuming, sometimes very difficult, and often neglected. The problem becomes next to impossible of solution when occupants have access to thermostat adjustments.

### Remote Control is Answer

Complete centralized remote control — indication, adjustment, and recording — provides simplified and centralized system management. It *completes* the system, assuring the continuous, uniform comfort for which the system was specified and purchased in the first place.

One man can supervise the entire installation. Immediate response is provided to tenants' requests for more or less heat. The constant up-and-down temperature pattern common in building areas where everyone has access to the thermostat is eliminated.

Additionally, remote control centers provide immediate detection of faulty operation so that corrective action can be taken before complete failure occurs.

### Electrionic Remote Control

The benefits and costsavings of centralized remote control are apparent in Barber-Colman Electrionic Control Centers.

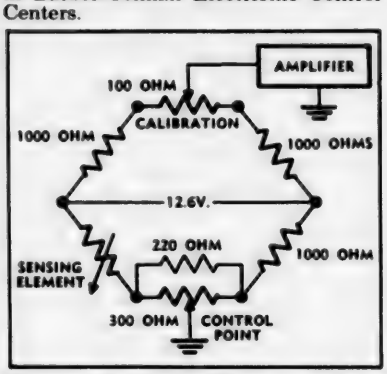
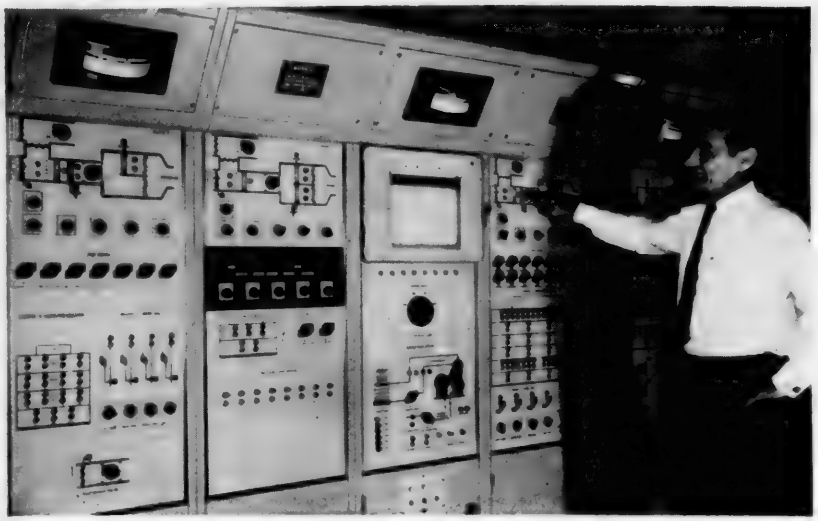



Diagram for Barber-Colman electronic temperature controlling circuit as used in Electrionic Control Centers. Ask for "Electronic Control Story" booklet.

Operation is simple and maintenance cost is negligible. Floor layouts and systems are shown schematically on the panel. By pushbutton control, the operator can instantly read on an indicating thermometer the temperature at any remote location. Temperature adjustment is made instantly by means of convenient control switches. Multi-point temperature recording instruments can be provided for analysis of system operation.



Five-panel Barber-Colman Electrionic Remote Control Center at International Mineral & Chemical Corporation, Skokie, Illinois. The center provides control for all major fans and circulating pumps and permits remote temperature indication and adjustment for all zones throughout five interconnected buildings. A multipoint recorder is provided for system analysis and permanent recording of equipment performance for future reference.
*Architect and engineer: Perkins & Will, Chicago, Ill. Mechanical Contractor: M. J. Corboy Corp., Chicago, Ill. Air Conditioning and Ventilating Contractor: Robert Irsay, Skokie, Ill.*

*Remote Temperature Sensing.* Instead of conventional electric thermostats, electronic room thermostats are used. They have no moving parts and will last indefinitely. They consist of a coil of wire through which a small current flows. Changes in room temperature change the coil resistance. Resulting changes in current flow unbalance a bridge circuit in the control center, actuating an electronic temperature controller.

*Electronic Temperature Controllers.* Barber-Colman electronic temperature controllers are the simplest and most dependable available. They include a single microrelay which requires 1000 times *less* power than that required by ordinary relays. As a result, the current from the sensing circuit can be amplified by only two commercial-type "radio" tubes. The load imposed on these tubes is so light that a life of five years or more is common. Tubes and relay are of the plug-in type for simple servicing.

*Electric Motor Operators.* The relays in the temperature controllers close circuits which position electric motor operators to actuate valves, dampers, or program switches for accurate, automatic system control.

*Override Switch.* In event of failure of an electronic controller, an override switch allows the individual motor operator to be adjusted manually until repairs can be made. One circuit cannot cause complete system failure.

### Simpler Installations

Not only does centralized remote control provide simpler operation and maintenance, it also makes the designers' and installers' jobs easier. All conduit and wiring are run to one central point for hookup to the factory-assembled Electrionic Control Center. The only remotely located elements are the dependable room thermostats and motor operators. All other circuitry is located at the control panel where it is easy to get at.

*For additional information* ask for Bulletin F-8944. Call your local Barber-Colman field office or write:

**BARBER-COLMAN COMPANY**

Dept. M, 1302, Rock Street, Rockford, Illinois

BARBER COLMAN

**Automatic Controls**

**See us at the ASHAE Show**
**Philadelphia—Jan. 26-29**
**Booth No. 118 & 122**

**GUARANTEED FREEDOM** ..... from flange and fitting failure is offered by this manufacturer. Modern scientific methods prevent all but the perfect flanges and fittings from reaching your job. Information is available.
Inside Front Cover — Item 200

**DRY AIR PROBLEMS** ..... have been solved for many companies through use of this manufacturer's steam humidifiers. Yours can be solved also. Bulletin is available.
Page 1 — Item 201

**NEW CONCEPT** ..... in built up air conditioning systems consists of incorporating the compresser and receiver in the same casing as the remote air cooled condenser. Substantial savings result. Information is available.
Page 2 — Item 202

**FROM CENTRIFUGAL VENTILATING..** fans to exhausters, from air washers to air cleaning equipment, units from this manufacturer deliver peak performance. Bulletin is available.
Page 5 — Item 203

**STEEL WELDING FITTINGS** ..... are made especially for 150-lb welded systems and are priced to make installed cost the same or less than that of threaded installations. Catalog is offered.
Page 7 — Item 204

**ARE YOU FIGURING** ..... tubing materials on a cost per year basis? Table in ad shows that new wrought iron from this manufacturer costs less and lasts longer. Bulletin is offered.
Page 9 — Item 205

**ANOTHER FUTURE** ..... of faultless service is assured for the Union Carbide Building, New York City, through use of the manufacturer's diaphragm type flush valves. Information is available.
Page 11 — Item 206

**PACKAGED INDUSTRIAL FANS** ..... featuring flat radial blade wheels are offered by this manufacturer to cope with virtuallly any industrial air or material handling problem. Bulletins are available.
Page 13 — Item 207

**COOLING WITH GAS** ..... is part of a long term modernization and expansion program at the University of Notre Dame. Absorption type water chiller guarantees long service-free life. Information is available.
Pages 14-15 — Item 208

**LOOK INSIDE** ..... the eight-page insert from this manufacturer to see all that's new in air conditioning and heating. Items include lithium-bromide absorption system, three-pipe induction system, and completely packaged hermetic centrifugal water chilling system. Information on these systems is available.
Insert Pages 17-24 — Item 209

**MULTI-STAGE PUMPS** ..... from this manufacturer are specially designed for high pressure and temperature clear water conditions. Constant hydraulic balance in the design is the key to the high efficiency these pumps deliver. Bulletin is offered.
Page 25 — Item 210

**Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.**

**The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement.**

**NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.**

**Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.**

**GAS-OPERATED** ..... absorption refrigeration is providing trouble-free, economical cooling at the U. S. Air Force Academy. This same type of automatic operation can put your heating system on a year-round paying basis, too. Information is available.
Pages 26-27 — Item 211

**CAPACITOR-START MOTORS** ..... from this manufacturer operate in any position, provide dependable starting, and pack more power into less space. Bulletin is offered.
Page 28 — Item 212

**PNEUMATIC TRANSMISSION SYSTEM** which is the world's largest keeps International Arrival Building of New York International Airport at its air conditioned best. Information is available.
Page 29 — Item 213

**ONLY THE BEST** ..... air conditioning system would be selected for our new headquarters, and experience proves the best is definitely gas. So states the president of a Washington, D. C., advertising agency. Information is available.
Pages 30-31 — Item 214

**AIR MOVING EQUIPMENT** ..... is designed for low initial cost and continuous, trouble-free performance. Each unit is completely built by the company. Catalogs are available.
Page 32 — Item 215

**AT GREATER PITTSBURGH** ..... Airport's new extension, this company's product insulates air conditioning duct work. It proved especially adaptable for use in irregularly curved ducts. Information is available.
Page 33 — Item 216

**NEW COMPRESSOR DESIGN** ..... for refrigerants 22 or 12 and air condensing is announced by this manufacturer. Eight exclusive design features assure easy surfacing, increased dependability, and smoother operation. Information is available.
Pages 34-35 — Item 217

**Circle numbers corresponding to the items and advertisements in which you are interested. Print your name and address clearly. Information will be sent directly from manufacturers.**

**INQUIRY CARD**

**Circle below item numbers on which you wish catalogs or further information**

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 |
| 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | | |

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| 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | | | | | | | | | |

**PLEASE PRINT** Jan. H-59

This service available only to U.S. and Canadian readers.

**Name** .....

**Title or Job Function** .....

**Firm** .....

**Nature of Firm's Business** .....

**Street** .....

**City** .....**Zone** ....**State** .....

This card is void after Apr. 1, 1959

**AIR CONDITIONING PRODUCTS** .....
for a large scale central or zone system, or a system for a smaller store or industrial plant, are designed, engineered and manufactured to work together. Information is available.
Pages 38-39 Item 218

**LOW COST COMPONENTS** .....
for high velocity systems are a specialty of this manufacturer of spiral duct, fittings, and sound absorbers. Catalogs and engineering data are available.
Page 40 Item 219

**PEAK PERFORMANCE PRODUCTS** ....
to fulfill the needs of the refrigeration and air conditioning industry are promised by this manufacturer as they enter their 25th anniversary year. Information is available.
Insert Pages 41-42 Item 220

**ONE PIECE PIPE INSULATION** .....
will permit you to reduce installation costs when insulating fittings. Others have compared "k" factors and cost factors, and have purchased this product. Information is available.
Page 43 Item 221

**PACKAGED WATER CHILLER** .....
from this manufacturer is compact, automatic, and easily installed. Available in 20 to 180 ton units. Bulletins are offered.
Page 44 Item 222

**THE SHAPE OF PROGRESS** .....
in centrifugal fans is the airfoil. This company brings the effectiveness and quietness of airfoil blading in a complete line of fans. Information is available.
Page 45 Item 223

**YOU DESIGNED** .....
the line of single stage centrifugal pumps offered by this manufacturer. On-the-job discussions with men who know what's needed in a pump were basic factors in the final design of performance features of the new line. Catalog is available.
Pages 46-47 Item 224

**ANOTHER NEW BUILDING** .....
using this manufacturer's air handling equipment is the curtain-walled Wachovia Bank and Trust Co. of Charlotte, N. C. Information is available.
Page 48 Item 225

**REFRIGERANT CONTROLS** .....
provide efficient, positive action whether powered by gas or electricity. Company offers the one complete line of refrigrant controls. Information is available.
Page 49 Item 226

**CUSTOM BUILT** .....
air conditioning units from this manufacturer will save time for yourself and money for your clients. Commercial, industrial and residential equipment is available to fill every need. Product literature is offered.
Pages 50 -51 Item 227

**FLUSH VALVES** .....
from this manufacturer are first with the features that cut maintenance. Result is more savings for your client. Catalog is offered.
Page 52 Item 228

**IN THE TYPICAL LAYOUT** .....
diagrammed in the ad, all-air high velocity units are teamed with this company's return air grilles to insure quiet, draftless, perfectly balanced air distribution. Information is available.
Page 53 Item 229

**IN THE TYPICAL LAYOUT** .....
diagrammed in the ad this company's all-air high velocity units are teamed with return air grilles to insure quiet, draftless, perfectly balanced air distribution. Information is available.
Page 53 Item 230

**STORAGE WATER HEATERS** .....
built by this company and factory-lined with Pre-Krete are fully guaranteed on workmanship and materials. On-the-site lining is also available. Catalog is offered.
Page 55 Item 231

**14th INTERNATIONAL** .....
Heating and Air Conditioning Exposition will be held in Convention Hall, Philadelphia, Pa., January 26-29, 1959, under the auspices of ASHAE. Exposition company suggests you write for advance registration.
Page 56 Item 232

**STAINLESS STEEL VALVES** .....
are also available from this valve manufacturer. Picture in the ad shows many points of excellence in the design and construction of the company's split wedge stainless steel gate valve. Catalog is offered.
Page 57 Item 233

**BLAST COIL HEATERS** .....
for package air conditioners and duct installation solve standard and unusual heating problems. Advantages include dependable performance and substantial design and field savings. Catalogs are offered.
Page 115 Item 234

**HEAVY OIL BURNER** .....
from this manufacturer is simple, practical and dependable. It will operate efficiently with any type of automatic control system. Information is available.
Page 119 Item 235

**COOLING TOWERS** .....
are designed by this company's engineers to perform like new after years of service. Special pressure creosoting of the wood fill prevents formation of fungus and algae which restrict tower air flow. Permanently lubricated bearings. Corrosion protective housings. Data are available.
Page 121 Item 236

**AIR CONDITIONING CONTROL** .....
utilising the manufacturer's temperature control helps make sales in leading shopping centers around the country. Information is available.
Page 129 Item 237

**IT IS ESSENTIAL** .....
to trouble-free operation that a forced hot water heating system be tightly closed and air free. This manufacturer's system eliminates automatic air vents and is guaranteed to end air troubles forever. Information is available.
Page 131 Item 238

**NEW HEATING PUMP** .....
is a vertical model offering a new high pump efficiency with a minimum motor size. Features close-coupled design and mechanical shaft seal. Complete pump and motor bolted to receiver. Sizes for all installations. Bulletin is available.
Page 133 Item 239

**COPPER TUBE FITTINGS** .....
are available in a carton which serves as a handy container on job, in truck, or in stock room. Contents are clearly indicated. Catalog is offered.
Page 135 Item 240

**HEAVY DUTY FURNACES** .....
are called a new philosophy in industrial and commercial warm air heating. It promises superiority from engineering down to the last weld in the stainless steel combustion chamber. Specification details are offered.
Page 137 Item 241

**AIR COOLED CONDENSERS** .....
from this manufacturer are available in more models with more capacity and more performance. With multiple installations, capacities are unlimited. Information is available.
Page 139 Item 242

**BOILER STARTING SERVICE** .....
offered by this packaged heating boiler manufacturer assures tip-top boiler performance and greater customer satisfaction. All units fully factory tested, ready to install on job sites; 80% efficiency guaranteed. Information available.
Page 140 Item 243

**HOSPITAL FOR SPECIAL SURGERY** ..
in New York City uses this manufacturer's quality motor control because dependability was so important in the air conditioning system. Information is available.
Page 141 Item 244

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flexible duct connections, vanes for elbows, air scoops, and louvers provide a quick, economical, easy, and practical source of these items. Eliminates most of the work. Shipped in dispenser-type cartons. Information offered.
Page 142 Item 245

**SHOWER MIXING VALVE** .....
is thermostatically controlled for the safest, most comfortable showering. There are no protruding edges to injure, no chance of accidental scalding. Information is available.
Page 143 Item 246

**MANY LEADING MANUFACTURERS...**
exhibiting at the Heating and Air Conditioning Exposition are getting more by using this manufacturer's motors. Data are available.
Page 144 Item 247

**CUSTOM MADE** .....
in unlimited air patterns, this company's square and rectangular air diffusers suit all job conditions and blend perfectly with any interior design. Catalog is offered.
Page 145 Item 248

**FAMOUS CONVENTION HOTEL** .....
located in Columbus, Ohio, enjoys and believes in the drawing powers of air conditioning with this manufacturer's equipment. Three bulletins are available.
Page 146 Item 249

**DUPLEX SUMP PUMPS** .....
of the vertical type are ready to provide instantaneous and lasting protection against flooding of vital mechanical equipment at the Bishop Clarkson Memorial Hospital, Omaha, Nebr. Engineering data are available.
Page 147 Item 250

**FOR CONDENSING REFRIGERANTS ..**
this company offers a simple, economical, air-cooled method that makes possible, for the first time, the elimination of fans, motors, cooling towers, noise and maintenance. Technical data are available.
Page 148 Item 251

**FULL LINE OF HEATERS** .....
offering a size and type for every heating need is backed by a highly trained and extensive service organization, with a reputation for dependability and thoroughness. Information is available.
Page 149 Item 252

**FLEXIBLE HOSE** .....
is adaptable for all kinds of fume and dust control and ventilation uses. It is durable, lightweight, and easy to install. Information is available.
Page 150 Item 253

**EXPANSION JOINTS** .....
from this manufacturer may be serviced in the line under full steam pressure. Costly shutdowns are eliminated. Catalog is available.
Page 150 Item 254

**NEW, STREAMLINED GRILLES** .....
from this company fit perfectly into modern architectural and engineering concepts. Extruded aluminum grilles meet every type of floor, sill and wall application. Selection guide is offered.
Page 151 Item 255

**A NEW ERA** .....
is brought to industrial heating by one unit providing space heating, ventilating, make-up air, oven applications, and drying. Engineering data are offered.
Page 152 Item 256

**ADJUSTABLE SPROCKET RIM** .....
with chain guide provides safe operation of overhead valve wheel, and is easy to install and operate. Catalog sheet and prices available.
Page 152 Item 257

**FIN TYPE COILS** .....
for air conditioning, heating and refrigeration applications, as well as pipe coils in complicted assemblies or production runs, are designed to insure long, trouble free life. Information is available.
Page 153 Item 258

**INSULATION ADHESIVE** .....
is specially formulated, and offers 30% savings on labor cost, a permanent bond, and a neater job. Catalog sheet and sample are available.
Page 153 Item 259

**BOILER LEVEL CONTROLS** .....
are claimed to be the safest because they are simplest in construction. Controls have permanent magnet located outside float chamber eliminating mechanical parts normally subject to wear and fatigue. Catalog is available.
Page 153 Item 260

**ROUND TYPE PUNKAH LOUVERS....**
are recommended for any difficult spot cooling or heating problem. They provide the most effective throw for their size and pressure. Catalog is offered.
Page 154 Item 261

**DRUM TYPE PUNKAH LOUVERS.....**
combine design and performance features that make them ideally suited for installation in large enclosures where extremely long throws are required. Catalog is offered.
Page 155 Item 262

**FAN-COIL-FILTER UNITS** .....
installed room by room in new or old construction are said by the manufacturer to be quiet beyond belief. Concealed, deluxe cabinet, and concealed or deluxe console, as well as three suspended types are offered. Literature available.
Page 156 Item 263

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SUBSCRIPTION DEPARTMENT

**HEAVY DUTY BOILERS** .....
for every steam or water heating application up to 1.8 million Btu per hr. output are found in this manufacturer's line. Information is available.
Page 157 Item 264

**INNER SPACE PROBLEMS** .....
can be just as baffling as outer space problems. When space is a factor, that's the time to specify these adjustable-angle thermometers. Information is available.
Page 157 Item 265

**FAN ENGINEERING DATA** .....
are offered in booklet published by this company which discusses low cost heating plant power-draft and industrial exhausting.
Page 158 Item 266

**NO FILTER** .....
does all jobs or meets every need. That's why the company's filters are engineered to the job to offer more effective dust collection. Bulletins are available.
Page 159 Item 267

**CAST IRON RECEIVERS** .....
in three sizes now offer a complete line of low pressure system condensate pumps to fit all requirements. Features include low return connection, low speed and long life. Bulletin is available.
Page 159 Item 268

**SPECIFICATIONS** .....
for the cooling and heating coils in the main air conditioning system of the House of Tomorrow Musical Theater in Fort Worth called for top quality and fast delivery. This manufacturer delivered both. Information is available.
Page 160 Item 269

**EXTRUDED ALUMINUM SHUTTERS**...
are of modern design, light weight, fully weather-stripped, easier to install, and are rust and corrosion proof. Complete specifications available.
Page 161 Item 270

**READY-TO-OPERATE BOILER** .....
is delivered, complete, to the job. Saves up to two full days' installation time. Full-fire factory tested. Field starting service costs contractor nothing. Seven sizes to 2,010,000 Btu. Oil, gas, and combination models. Information available.
Page 161 Item 271

**DUCT FANS** .....
in this installation take fumes up and out, saving valuable floor space in busy working area as compared with old, space wasting system. Bulletin is offered.
Page 161 Item 272

**HIGH VELOCITY FILTERS** .....
are built to last and offer unexcelled performance. They are quality filters you can be proud to specify. Bulletin is available.
Page 162 Item 273

**DIVERT AIR** .....
where you want it by means of this company's scoop-type device which gives you maximum control of any forced air system. Catalog and information are offered.
Page 163 Item 274

**COMPACT AND QUIET** .....
are the efficient cooling towers offered by this manufacturer. At the Civic Auditorium in Albuquerque, N. M., three problems were solved by these towers. Two bulletins are available.
Page 164 Item 275

**CENTRALIZED REMOTE CONTROL** ...
completes an air conditioning system. With centralized remote indication, adjustment, and recording, the system delivers continuous complaint-free comfort. Bulletin is offered.
Page 166 Item 276

**ONLY A FEW** .....
seconds' time is required to insert cartridges in the manufacturer's efficient and high capacity angle filter-drier. Bulletin is offered.
Inside Back Cover Item 277

**ELECTRIC FLOW SWITCHES** .....
are applicable wherever it is important to know if a flow of liquid starts or stops. Dependable and moderately priced, they make or break electric circuits to control alarm, motor, burner, metering device, etc. Bulletin details applications.
Back Cover Item 278

**INQUIRY CARD**

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An efficient and high capacity multiple cartridge filter-drier with a drying and flow capacity range up to 100 tons.

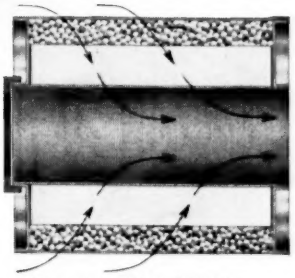
# Low Pressure Drop...No By-Pass Required

Type 875-CMS Cartidges for these new filter-driers are completely self contained, self sealing and self positioning. Only a few seconds time is required to insert cartridges, resulting in a minimum loss of cartridge efficiency as the desiccant cannot pick up any appreciable amount of moisture from the air because of installation speed.

A parallel flow pattern through the individual cartridges results in maximum efficiency and low pressure drop.

Available in 1⅛" to 2⅛" O.D. Solder connection sizes.

Write for Henry Bulletin 75-FD describing these units.



**TYPE 875-CMS FILTER-DRIER CARTRIDGE WITH**

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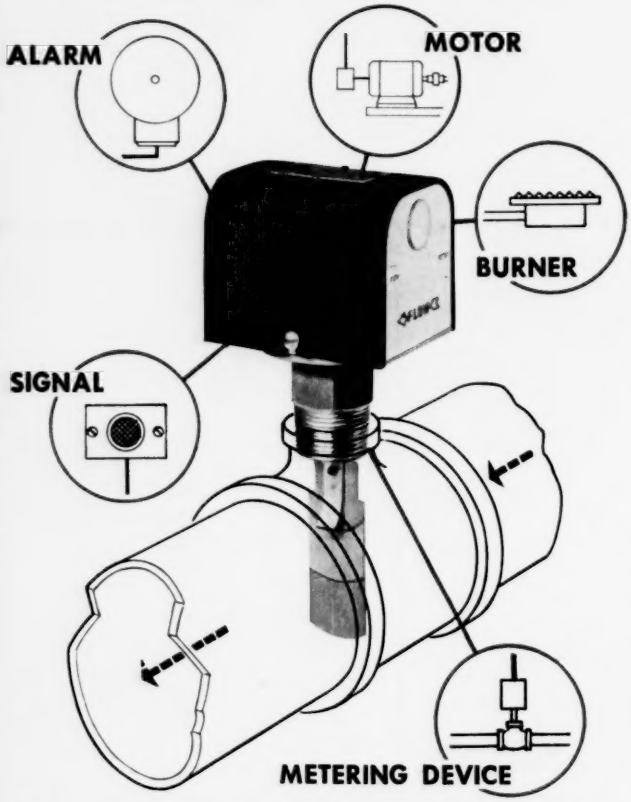
Fourteenth International Heating & Air-Conditioning Exposition, Philadelphia, Jan. 26-29, 1959

# STOP or GO accord

## McDONNELL FS4 SERIES FLOW SWITCHES

### Versatile new way to start or stop a...




Wherever it is important to know if a flow of liquid starts or stops, right there you have a spot for the McDonnell FS4 Series Flow Switch. It is a dependable, moderately-priced device that makes or breaks an electrical circuit when flowing liquid moves the paddle. It's an effective way to provide safer or more automatic operation, available now in compact size and price to fit a broad range of applications.

*Write for new bulletin Number FS-1 which shows the many possibilities this new Flow Switch offers as an automatic control or safety device.*

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## *Flow Switches*

*Your Jobber Stocks Them*

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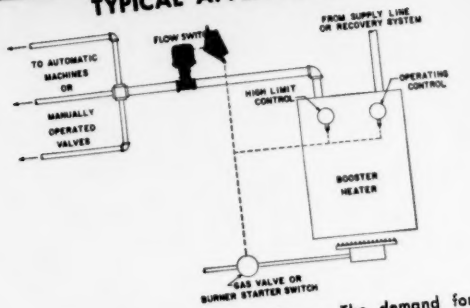
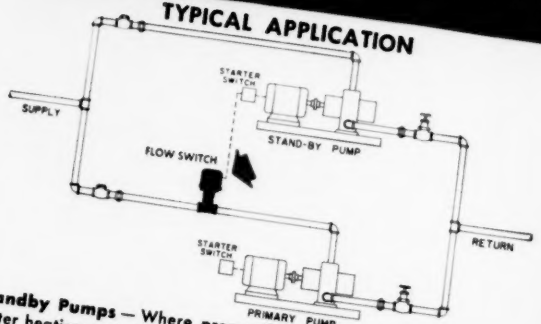

TO AUTOMATIC MACHINES OR MANUALLY OPERATED VALVES
FLOW SWITCH
FROM SUPPLY LINE OR RECOVERY SYSTEM
HIGH LIMIT CONTROL
OPERATING CONTROL
BOOSTER HEATER
GAS VALVE OR BURNER STARTER SWITCH

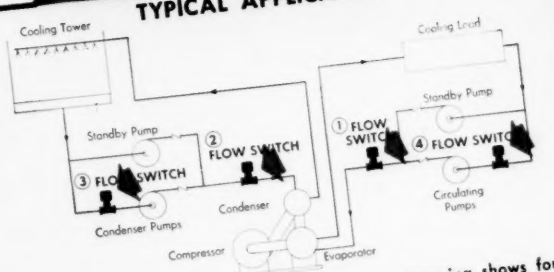
**Hot Water Supply for Dishwashers** — The demand for 180° water for rinsing tableware in public establishments (and for other commercial processes) frequently requires a booster heater. But the operating control on such a heater may not respond quickly enough, when a sizeable volume of water is drawn, to keep water from falling below 180°. With a flow switch in the line burner is started immediately when a draw of water occurs, to start recovery at once. When flow stops, flow switch returns control to the primary control.

### TYPICAL APPLICATION




**Standby Pumps** — Where proper fluid flow is essential — as in hot water heating and chilled water cooling systems — a standby pump is often installed in parallel with the primary pump. In the system above, a reverse acting flow switch (*breaks* current with flow) is installed in discharge line from primary pump. If pump fails, and flow stops, flow switch cuts in standby pump.

### TYPICAL APPLICATION




**Chilled Water Air Conditioning System** — Drawing shows four flow switches installed in the system. The circulating pump is started in normal manner. When there is sufficient flow, and only then, flow switch No. 1 allows the condenser pump to be started. Similarly, flow switch No. 2 allows compressor to be started when there is sufficient flow of condenser water. Flow switches No. 3 and 4 have reverse-acting switches, automatically cut in standby pump if primary pump fails. Use of the flow switches in this system assures continuous operation, starts system in sequence, stops compressor if there is not proper circulation in system, can be used to report operation on central control panel.